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THE DISMOUNTED INFANTRY AGGREGATION METHODOLOGY (DIAM) IN THE JIFFY GAME

Technical Report TR 1-82

UNITED STATES ARMY

COMBINED ARMS CENTER

COMBINED ARMS
COMBAT DEVELOPMENT ACTIVITY
COMBINED ARMS STUDIES AND ANALYSIS ACTIVITY

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ABSTRACT

Results from low resolution corps and division level war games and simulations have become increasingly important to decisions involving weapon system procurement and the force structuring process. In the past, dismounted units have been poorly represented in these models. Games such as Jiffy and the developmental CORDIVEM did not portray explicitly the attributes of dismounted squads and platoons. These games were usually oriented to the armor/antiarmor battle, with end of simulation occurring at about 500 meters. Consequently, the effects of dismounted units in the corps/division level combined arms battle were not accounted for satisfactorily. This report describes a method for representing such battles in division or corps level simulations by aggregating terrain effects and numbers of weapon systems in order to reduce set up and run requirements while explicitly representing dismounted tactics, weapon lethality, and target vulnerability. The method has general applicability in existing war games. It has been implemented as a computerized combat model in the Jiffy war game and used in gaming support for the High Technology Light Division study.

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CHAPTER 1

MODEL METHODOLOGY

1-1. BACKGROUND AND PURPOSE.

a. The role of the Combined Arms Studies and Analysis Activity (CASAA) in the hierarchy of Army analysis requires the study of corps and division level problems. Analyses at this level, including results from corps and division level war game simulations, have become increasingly important to decisions involving weapon system procurements, force structuring, and scenario generation for the TRADOC community.

b. The armor-antiarmor battle is generally well represented in most corps/division models, as are other combined arms aspects such as indirect fire, tactical air, close air support, air defense, and minefields. However, the contributions of small infantry units--especially those involving dismounted operations--have not been adequately represented. Most corps/division level simulations represent closure of the forces to ranges of 1000 to 500 meters. At this point the simulated battles are terminated without regard to the closure, assault, and withdrawal phases.

c. Analysis conducted with these models often fails to give decisionmakers a basis for evaluating the effectiveness of dismounted infantry. Consequently, in February 1980 CASAA was tasked by Commander, Combined Arms Center (CAC) to develop methods for simulating the effectiveness of dismounted infantry in a combined arms corps/division environment. A two-phased effort was initiated to address this problem.

(1) The first phase consisted of the basic research necessary for any combat model development. During this phase the critical battle activities impacting on division effectiveness were defined through the use of mission profiles supplied by the US Army Infantry Center (USAIC) and through informal discussions with USAIC personnel. A review of the ability of currently running combat models to represent these activities was also conducted. The first phase of the study was completed by developing a methodology for representing these activities in a low resolution division model. The methodology included identification of the basic infantry units that must be modeled, algorithms describing the effectiveness of these units in various activities, and data sources to support these algorithms. A complete report on this phase of the study effort is contained in CASAA TR 6-81, Dismounted Infantry Aggregation Methodology Study (DIAMS), August 1981.

(2) The second phase of the effort was implementation of the methodology; i.e., building the model (the Dismounted Infantry Aggregation Model--DIAM), constructing the data bases, validating the model, and exercising it in support of several CAC studies. Model construction was completed in September 1981, and interface with the corps/division level Jiffy War Game took place in October 1981. Although DIAM is currently in use as a

submodule of Jiffy, it can also be used alone to analyze the effectiveness of a combined arms force as it closes on dismounted infantry positions from ranges of 1000 meters.

d. The purpose of this report is to provide a documented reference for DIAM. The report is designed to serve two types of readers.

(1) Chapter 1 describes the overall methodology used in developing the computer code. It contains a general discussion of the algorithms used to represent the dismounted battle and is provided for the use of those readers interested in "What's going on inside the model."

(2) Chapters 2 and 3 were developed for those readers who are interested in executing the model. Chapter 2 describes the model data base. Chapter 3 contains a listing of the model code. DIAM is written in FORTRAN 77 using a modular design dictated by standard software engineering practices. The code listed in chapter 3 represents the current Jiffy application of DIAM in subroutine form. The code could easily be modified for use in stand-alone form.

1-2. THE DIAM DATA/INFORMATION FLOW STRUCTURE. DIAM is a time stepped, expected value simulation. During each minute of battle, the movement of both forces, their ammunition expenditures, and losses to both forces are calculated. The model requires an extensive data base to represent the lethality, vulnerability, and mobility of a dismounted force in a combined arms battle. Figure 1-1 shows the various types of data bases required by the DIAM attrition model. The figure shows that the model requires data inputs from two sources, a host and its own internal data base.

a. Data Input From Host. Host inputs are used by DIAM to establish a battle scenario. In essence they describe who is fighting, what type of battle the user wishes to model, and where (type of terrain) the fight will occur. They represent a simplified version of the type of scenario data required for a high resolution model. The host may be either a larger model using DIAM as a submodule, such as Jiffy, or an analyst/gamer using DIAM in the stand-alone version. The following data are required from the host:

(1) Weapon lists. Complete lists of all weapons to be represented in the DIAM battle must be provided by the host. DIAM currently has a library of 25 different weapon types (e.g., Viper, Dragon, IMAWS, M-1, IFV) for Blue and 25 types for Red. The user is allowed to select a maximum of 10 Blue types and 10 Red types for each battle. The number of weapons of each type (e.g., 75 Viper, 5 Dragon, 10 M-1) must also be provided by the user. The model automatically positions these weapons on the terrain in response to the user's selection of battle scenario (see para b(2), Terrain effects, below).

(2) Artillery firing rates. Artillery firing rates and loss rates to each weapon type are also required from the host. The version of DIAM described in this report uses the Jiffy artillery module to assure consistency

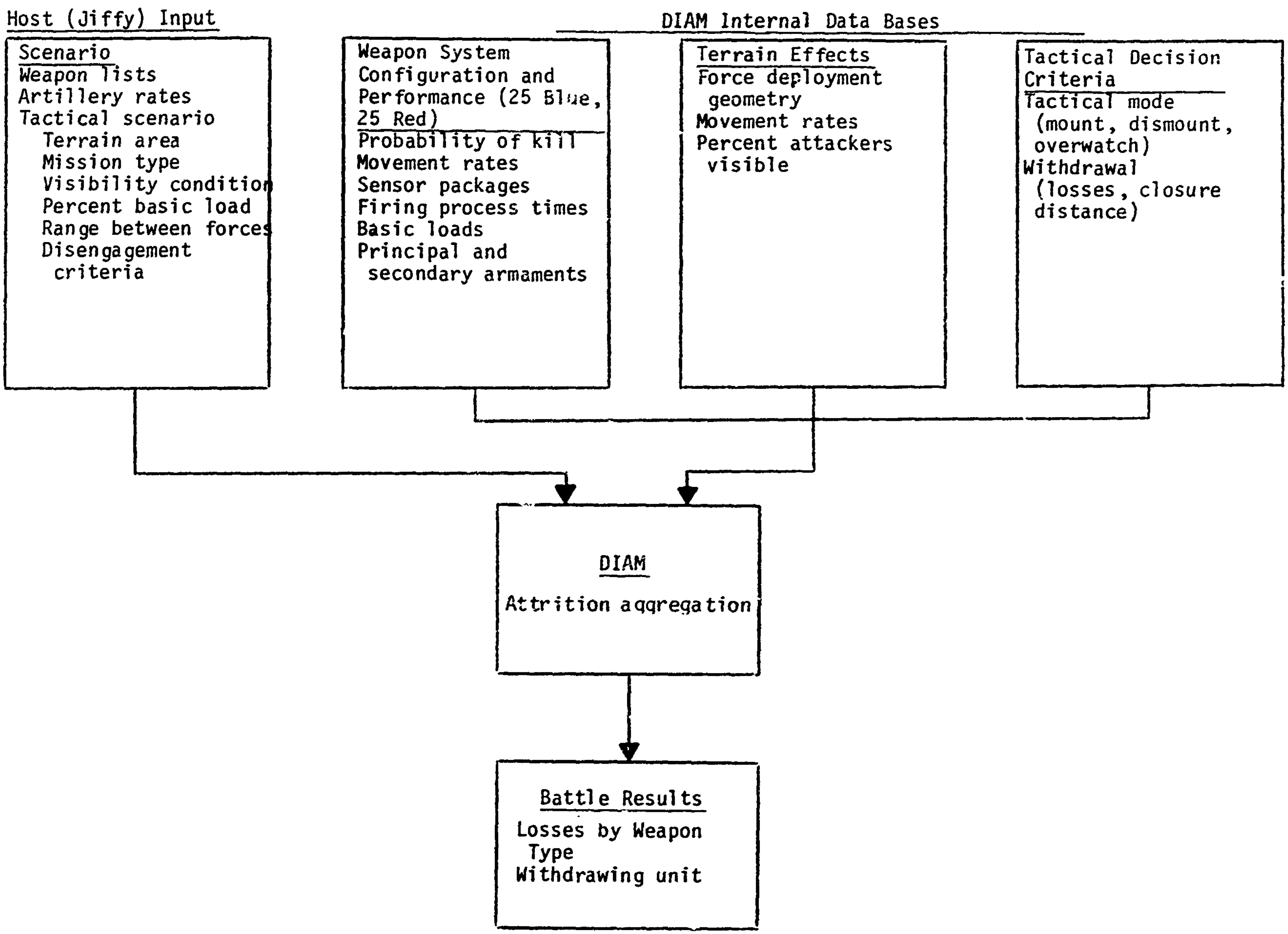

Figure 1-1. DIAM data and information flow.

with other Jiffy results. However, DIAM is structured so that lethal area/target density artillery loss algorithms could easily be implemented in the module.

(3) Tactical scenario. Host selection of the tactical scenario is also required. The DIAM module currently has a library of six terrain areas available. The user is required to select a terrain location and denote either the Red or the Blue force as attacker. DIAM responds by accessing the proper terrain data base and arraying the user-defined forces on the terrain. The visibility condition (day, night, or obscured) is also required by the module. Two other host data elements are required to describe the DIAM battle framework. The initial condition of both forces is represented by the percent of basic load available to each weapon type and the opening ranges between the forces. The opening range must be less than 1000 meters. The host data element describing disengagement criteria is an optional requirement. The DIAM structure allows the host to specify attrition thresholds and range thresholds for each weapon type. These thresholds represent maximum loss levels and minimum closure distances to enemy force elements that will be sustained by a force prior to its withdrawal. Violation of these thresholds for either force will initiate its withdrawal. If the user does not specify these thresholds, they will be specified by the DIAM module.

b. Internal Data Base. The DIAM module also maintains an extensive internal data base. Referring again to figure 1-1, the model has access to a computerized library describing various terrains and weapon systems. These library entries are accessed by the module in response to host requirements. The libraries fall into the following categories:

(1) Weapon system configuration and performance. These data describe weapon system performance under various postures (attack or defend) and environmental conditions (day, night, obscured day). They are supplied by the US Army Materiel Systems Analysis Activity (USAMSAA) and the Night Vision and Electro-optics Laboratory (NV&EOL). The elements of this part of the data base are:

- Single shot kill probabilities for each ammunition against each platform type in both defensive and attack postures. Platforms are representative of both vehicles and personnel.
- Movement rates under day and night conditions by platform type.
- Time required by sensors to detect a target at various ranges. DIAM divides its sensors into four categories: unaided eye, optically aided eye, generic image intensifier, and generic thermal device.
- Time required to aim, fire, guide, and reload for each weapon system.

- Principal armaments and basic loads for each platform. Weapon platforms (personnel, vehicles, crews) can carry multiple weapons in DIAM. For example, an infantry Dragon gunner can also engage personnel targets with a rifle.

(2) Terrain effects on vehicles and personnel.

(a) The terrain data base contains data representing an important tactical aspect of the DIAM battle. Each of the weapons selected by the DIAM user is assigned to one of four general groups:

- Personnel
- Heavy armor vehicles
- Light armor vehicles
- Systems offset from the battle by more than 1000 meters (e.g., mortars, TOW).

These categories are used by DIAM to establish movement locations and the tactical geometry of the force structures. The module considers the center of mass for each group for all calculations involving movement and range parameters. The tactical terrain data base contains initial locations for the center of mass of each DIAM group and is used by the module to deploy weapon systems in a representative tactical array at the beginning of each battle.

(b) The terrain effects data base is used by DIAM to determine the percent of each force visible to firers in the opposing force. This data base was developed using defensive positions and attacker approach routes resulting from a map analysis conducted by CASAA and the US Army Infantry School. The CASAA Battlefield Visualization Graphics computerized terrain system was used to analyze the area along the avenues of approach visible to each defensive position. This provided the percent of the attack corridor visible in range bands of 200-meter increments to each defensive position. As the DIAM attrition module moves the threat forces along the attack corridors, the percent of corridor visible is applied to the force, providing number of systems that can be targeted by the defenders. DIAM currently has a library of six different terrain tactical situations. Analytical procedures to develop data bases for new situations require approximately 2 mandays. A discussion of these procedures can be found in Chapter 2 of this report.

(3) Tactical decision criteria.

(a) The DIAM module simulates tactical responses of both individual weapon systems and the force to battle conditions. Individual tactical responses are limited to the following:

- Personnel riding in light armor vehicles may dismount for an assault.
- Dismounted personnel withdrawing from the battle may mount available light carriers.
- Light armored vehicles may take up overwatch positions.

These tactical responses are triggered by closure distances between the groups. For example, the Red commander may want 50 percent of all mounted personnel to dismount their carriers when they move within 300 meters of the Blue defender's dismounted Viper positions. The tactical data base contains the desired range at which the tactic must be executed, the percent of the group required to perform the tactic, and an identifier of the opposing group triggering the tactic. Under conditions requiring a DIAM group to operate in two tactical modes (in the example, 50 percent personnel mounted, 50 percent dismounted), the module splits the group to represent movement and location characteristics of both groups.

(b) Force tactical responses are centered around the decision to withdraw from the battle. As mentioned previously, the host can optionally provide criteria (percent of force lost, range between groups) to trigger withdrawal. If these are not provided by the host the module defaults to the values found in this data base. DIAM's current implementation in Jiffy allows the gamer to override the withdrawal criteria (either stay and fight or move out) following status reports, which are given at selected intervals during the DIAM battle.

1-3. ALGORITHMS USED IN DIAM.

a. Figure 1-2 presents a generalized logic flow of the processes occurring in the DIAM module. The purpose of this diagram is to provide a framework for consideration of the attrition algorithms used in the module. The DIAM module is a deterministic model using expected value techniques for calculating weapon losses to both forces. DIAM first selects the appropriate weapon system data and terrain data for the battle to be played, then locates the forces in their tactical positions on the terrain. For each battle minute, DIAM constructs a firing profile for each weapon system. This profile consists of the number of targets visible and within range that are detected by the system. On the basis of this profile, the model calculates the rounds fired by each system. Losses to each firer and target are then determined, and force levels are updated. The number of incoming rounds and the losses sustained by the force are used to calculate suppressive effects for the next minute of battle. Suppression affects rate of fire, movement, and vulnerability. After suppressive effects are calculated, movement rates are determined and force weapon positions are updated for the current minute. Tactical thresholds are then compared with current positions and force levels. If the disengagement criteria are satisfied, tactical requirements (for example, mounting of vehicles) are performed and a timer is set for the disengagement period. Individual tactics also may be altered (dismount, overwatch) in response to tactical thresholds. A new terrain data base is retrieved from the module library to represent reduced visibility conditions between forces during disengagement and pursuit, and the status of affected groups is updated. DIAM assumes that disengagement is completed after 10 minutes. A final battle report is printed following disengagement.

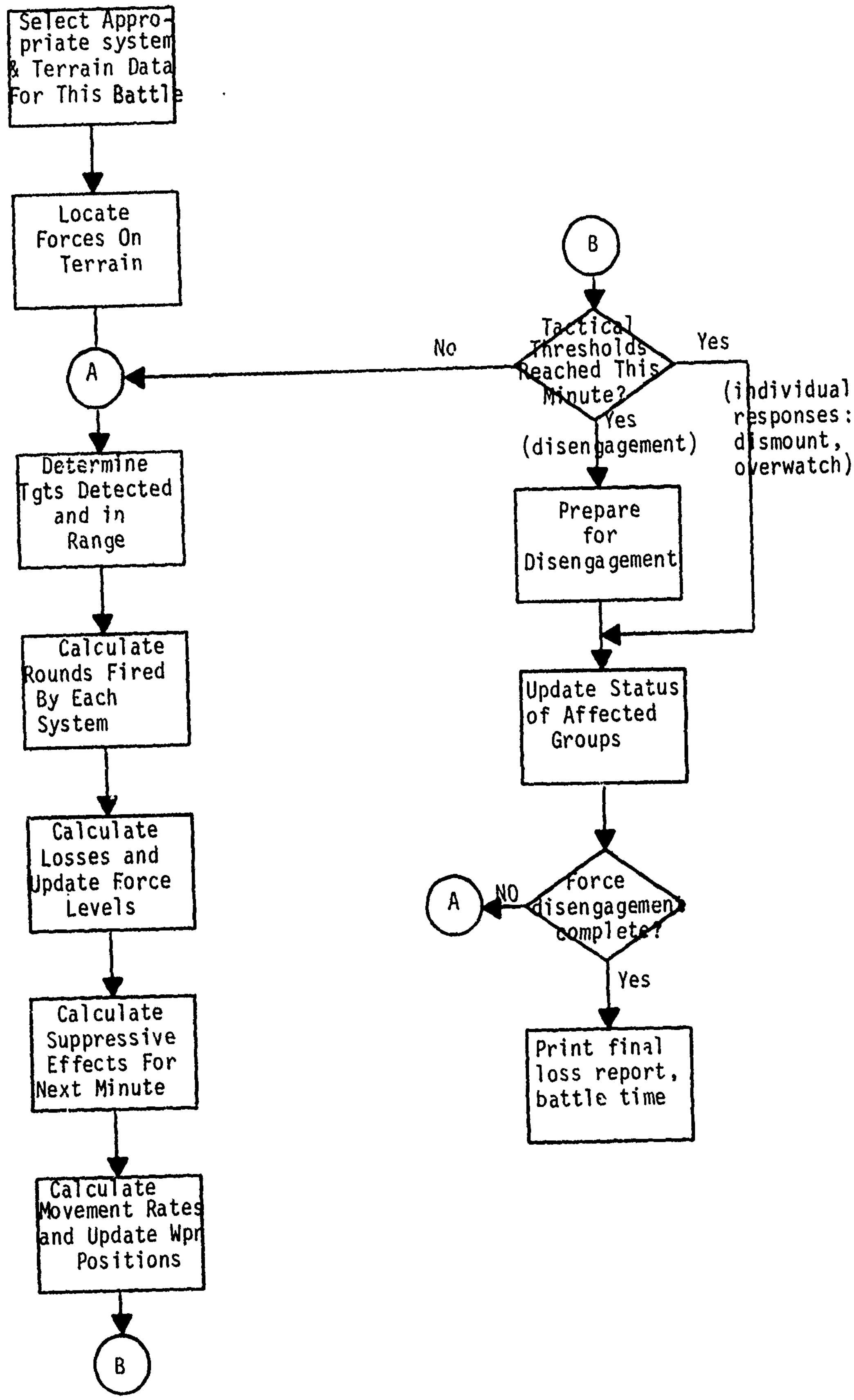

Figure 1-2. DIAM Logic Flow for Both Attackers and Defenders.

b. The following paragraphs provide a detailed description of the algorithms used for calculation of rounds fired, determination of losses, calculation of suppressive effects, and calculation of group movement. The remaining steps are primarily model bookkeeping and are documented in the DIAM computer code found in chapter 3.

(1) Calculation of rounds fired. The maximum number of rounds fired per minute by weapon i at target j is R_{ij}, which is the reciprocal of the time required to fire one round at the given target; i.e., $R_{ij} = 1/T_{ij}$.

$$T_{ij} = (D_{ij}/F_{ij} + A_{ij} + L_i + M_{ij})\ N_{ij}/N_i \qquad (1\text{-}1)$$

where:

T_{ij} = expected time in minutes for a weapon of type i to fire at a target of type j, given a uniform distribution of fire at all targets available.

D_{ij} = expected number of minutes for a weapon of type i to detect a weapon of type j.

F_{ij} = number of rounds fired by i at j per detection.

A_{ij} = expected number of minutes required to aim i at j.

L_i = expected number of minutes to reload i.

M_{ij} = expected number of minutes for projectile from i to reach j.

N_{ij} = expected number of targets of type j visible to firer i.

N_i = expected number of targets of all types visible to firer i.

(a) This firing rate assumes targets are of equal priority and are allocated uniformly across all targets visible and detected by the firer. If other types of allocations are desired, it is only necessary to change the fraction N_{ij}/N_i to the desired weighting method. The number of targets visible N_{ij} is calculated in the following manner:

$$N_{ij} = n_j(1-\overline{v})\ v_{IJ}\ (1 - \frac{S_j}{2}) \qquad (1\text{-}2)$$

where:

n_j = the total number of target weapons of type j in the target force.

$\bar{v}$ = the fraction of the terrain corridor containing target weapon system j not visible to any of the firing force containing system i.

v_{IJ} = the fraction of the terrain corridor containing target systems of category J visible to all firing weapons of category I. Recall that all weapon systems fall into one of four categories (dismounted personnel, heavy vehicles, light vehicles, mortars). In this case J is the category containing the target system j and I is the category containing the firing system i. These visibility fractions vary by 200-meter range bands as measured between weapon systems i and j.

S_j = the fraction of targets of type j suppressed for this minute. The factor $\frac{S_j}{2}$ represents DIAM's modeling of one-half of all suppressed personnel in a temporary covered position.

(b) This firing rate (R_{ij}) is for unsuppressed situations--suppression will reduce this rate as follows:

$$R'_{ij} = R_{ij} S_{it} \tag{1-3}$$

where:

R'_{ij} = suppressed firing rate of weapons of type i at targets of type j.

R_{ij} = unsuppressed firing rate of weapons of type i at targets of type j.

S_{it} = suppression factor for firing times of weapon i at time t.

(2) Calculation of loss rates.

(a) The expected number of weapons (considered as targets) of type j killed by weapons in the opposing force of type i is determined from the following equation:

$$K_{ij} = N_{ij} \left(1 - (1 - P_{ij}/N_j)^{R'_{ij} \alpha_i C_{ij}}\right) \tag{1-4}$$

where:

K_{ij} = the expected number of type j weapons killed by type i weapons.

N_{ij} = the expected number of type j weapons visible to weapons of type i.

P_{ij} = the single shot kill probability of weapon i against weapon j.

R'_{ij} = suppressed firing rate of weapons of type i at targets of type j (from equation 1-3).

C_{ij} = number of weapons of type i firing at targets of type j.

α_i = the fraction of aimed rounds fired by weapon system i. For attackers, $\alpha_i = 0.30$. For defenders $\alpha_i = 0.60$.

(b) The number of weapons of type i firing at target type j is given by:

$$C_{ij} = n_i \, v_{JI} \, (1 - \frac{S_i}{2}) \qquad (1\text{-}5)$$

where:

n_i = the total number of weapons of type i in the firing force.

v_{JI} = the fraction of firing positions of weapons in category I visible to target weapons in category J. Note that the use of v_{IJ} in the computation of the number of targets and v_{JI} in computing the number of firing weapons causes the following representation in the model: the number of firers engaging targets j are only those that have physical line of sight to j (represented by v_{JI}). Likewise, the number of targets j engageable by i are only those that can be seen by i (represented by v_{IJ}).

S_i = the fraction of firing systems of type i suppressed for this minute. $S_i/2$ indicates that one-half of all suppressed weapons in DIAM do not fire.

(c) Equation 1-4 is consistent with the assumption that targets are selected at random with replacement. Bash and Inselmann (1979) derived the equation. Also developed there is the equation for determining the expected number of kills when more than one type of weapon is firing at one target type and all targets can be engaged by all weapons:

$$L_j = (1 - \prod_{\text{all } i} (1 - \frac{K_{ij}}{N_{ij}})) \, N_{ij} \qquad (1\text{-}6)$$

where:

L_j = expected number of losses per minute of weapons of type j.

K_{ij} = expected number of type j weapons killed by type i weapons (from equation 1-4).

N_{ij} = number of weapons of type j in force visible to weapons of type i.

Equations 1-4 and 1-6 produce an approximation to the situation where different weapons see different subsets of targets.

(3) Calculation of suppressive effects. The DIAM suppression module was taken from the Jiffy war game. This module provides suppression of the firing rates and movement rates for both dismounted personnel and vehicular mounted armaments. The following four equations are used to calculate the suppressive effects in DIAM.

$$Y_i = W_i\ (2.06\ X + 1.54)/100 \qquad (1\text{-}7)$$

$$Y_i = W_i\ (1.06\ X + 0.14)/100 \qquad (1\text{-}8)$$

$$Y_i = W_i\ (8\ X^{1.5} + 3.28)/100 \qquad (1\text{-}9)$$

$$Y_i = W_i\ (2.5\ X^{1.5} + 0.5)/100 \qquad (1\text{-}10)$$

where:

Y_i = fraction of weapons of type i that are suppressed.

X = ratio of total losses suffered by weapons of type i from direct fire, artillery, and mines to total losses inflicted by weapons of type i.

W_i = 1 for category 4 (heavy) weapons and 2.86 for all other types of weapons (from Jiffy).

Equation 1-7 is for defenders in the engagement phase, 1-8 is for defenders in the withdrawal phase, 1-9 is for attackers in the engagement phase, and 1-10 is for attackers in the withdrawal phase. The maximum suppression for firing is set at 0.8 and the maximum for movement is 0.9. Suppressed systems are less lethal and less vulnerable (see use of S_i, S_j in equations 1-2, 1-3, and 1-5). Lethality and mobility are assumed to be reduced because systems being suppressed will seek available cover. This in turn is assumed to make the system less vulnerable.

(4) Calculation of movement rates and tactical locations.

(a) The movement rate for each weapon is calculated by reading the unsuppressed rate for this terrain and tactical scenario from the data base and then applying the suppression factor:

$$M'_{it} = M_i\ (1-V_{it}) \qquad (1\text{-}11)$$

where:

M'_{it} = suppressed movement rate for weapon i at time t.

M_i = unsuppressed movement rate from data base.

V_{it} = fraction of movement suppressed by previous incoming fire.

These rates are adjusted so that weapons in overwatch positions do not move and any vehicles with dismounted personnel will move at the dismounted rate in the meeting and engagement phase of the battle.

(b) Tactical geometry is represented by locating the components of each force about a central force reference point. Each weapon played in the model is categorized as belonging to one of four groups (dismounted personnel, heavy armor, light armor, or mortars). The initial locations of the center of each group with respect to the force reference point are maintained as part of the data base for each tactical scenario available for play in the DIAM submodel. Selection by the main program of a particular scenario causes the DIAM submodel to modify the position of each weapon group based on the following formula.

$$LR_{j0} = D + \Delta_J \quad (1\text{-}12)$$

$$LB_{i0} = D + \Delta_I \quad (1\text{-}13)$$

where:

LR_{j0} = location of all Red weapons of type j at time zero.

LB_{i0} = location of all Blue weapons of type i at time zero.

D = range between center of mass of forces at start of the battle.

Δ_I, Δ_J = the offset distance of one of four weapon categories from the center mass of the force. Δ_I is the offset for all Blue weapons of category I. Likewise, Δ_J is the offset for all Red weapons of category J.

(c) Each weapon location is changed each minute based upon a suppressed movement rate such that the location at any time (t + 1) minutes into the battle is defined by:

$$LR_{j,t+1} = M'_{jt} + LR_{jt} \quad (1\text{-}14)$$

where:

$LR_{j,t+1}$ and LR_{jt} = the location at time t+1 and t respectively of weapon j.

M'_{jt} = the suppression of movement for weapons j during minute t.

The DIAM battle begins with the attacking force moving toward the defensive positions. Losses are assessed to both forces until a tactical threshold is reached. At this point the withdrawal phase of the battle is begun. This is simulated by a change in the percent visible tables (representing a force minimizing intervisibility with the enemy as it breaks contact). The model moves the withdrawing forces out of firing range and then prints the losses to both Red and Blue forces.

1-4. REFERENCES.

Bash, D. and Inselmann, E., 1979, Target Selection Assumptions and Their Effects on an Assessment Equation. Technical Paper 2-79, US Army Combined Arms Center, Fort Leavenworth, KS.

Godfrey, L., Etheridge, E., Arrington, S., and Pickett, H., 1981, Dismounted Infantry Aggregation Methodology (DIAMS). Technical Report 6-81, US Army Combined Arms Center, Fort Leavenworth, KS.

CHAPTER 2

DIAM FILE STRUCTURES

2-1. DIAM INTERNAL DATA BASE.

a. The DIAM internal data bases are used by the model to describe weapon performance, the terrain effects on the surviving force, and the tactical disengagement criteria. The data are stored on five random access files as shown in figure 2-1.

(1) The Weapon Vulnerability file (Logical Unit 16) contains probabilities of kill for 25 Blue weapons and 25 Red weapons. The probabilities are stored in a range-dependent manner. Two files exist, one representing Blue in prepared defensive positions and the other representing Blue in an attack.

(2) The Terrain Effects file (Logical Unit 25) contains data describing the percentage of the opposing force visible to both attackers and defenders. The percentages are both weapon and range dependent. Six terrain sites (four in the Mideast and two in Europe) are currently available in the DIAM model.

(3) The Movement Rates file (Logical Unit 20) contains rates of advance for four weapon categories; i.e., dismounted personnel, heavy armored systems, light armored systems, and mortars. The movement rates are dependent on terrain type and visibility conditions.

(4) The Target Acquisition Rate file (Logical Unit 20) provides average acquisition times for four sensor types (optical systems $.4\mu - .7\mu$, image intensifier systems $.7\mu - 1.1\mu$, far infrared systems $8\mu - 14\mu$, and the unaided eye) detecting four target types (vehicular target fully exposed or in hull defilade and personnel target fully exposed or in foxhole). The acquisition times are dependent on target range and atmospheric visibility.

(5) The Weapons Characteristics file (Logical Unit 15) is used to describe the primary sensor type, movement rate category, and basic load of the primary armament for each of the 25 Blue and 25 Red weapons found in the Weapon Vulnerability file. For several weapon systems the DIAM model considers both a primary and secondary armament. For dismounted personnel carrying a Dragon or Viper, the model also plays rifle fire against opposing personnel targets. The basic loads for secondary systems are updated by the DIAM model logic and are not contained in this data base.

b. It will be noted from figure 2-1 that DIAM uses the random access file in a read only mode. The random access structure provides the user with flexibility in selecting weapon systems, terrain type, and environmental conditions for play in the dismounted battle. The following paragraphs provide detailed descriptions of the file structures. To avoid classification of this report, example data bases are not included. However, example data bases can be obtained from the US Army Combined Arms Studies and Analysis Activity, Fort Leavenworth, KS upon submission of proper clearances.

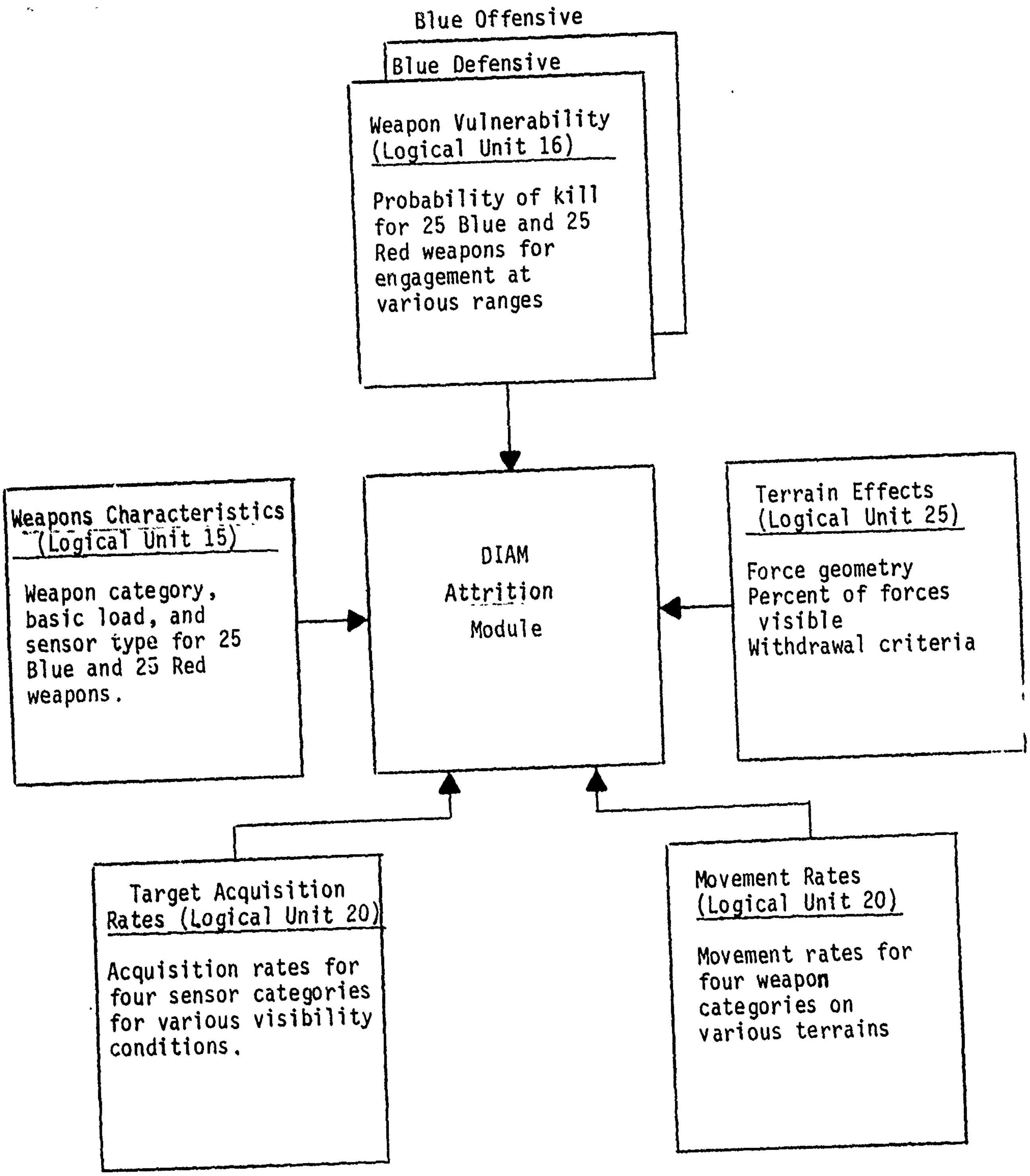

Figure 2-1. DIAM internal data bases.

2-2. FILE STRUCTURE FOR TERRAIN EFFECTS.

a. The terrain effects data are used by the model to represent the percent of forces visible to both attacker and defender during the battle. This data base is developed using digitized terrain and military judgment in selecting the best approach routes and defensive positions for a particular terrain location. Figure 2-2 shows the first step in developing this data base. A piece of digitized terrain has been selected representing the battle site. The possible approach routes have also been noted on the map.

b. The second step in data base development is shown in figures 2-3 and 2-4. Defensive positions have been selected representing typical positions for two of the weapon categories. Line-of-sight fans representing the visible portions of the advance routes have also been drawn using the digitized terrain data base.

c. The final step in data base development is to calculate the percent of attacker corridor visible by range band for each of the defender positions. The resulting percents are used in the terrain effects data base.

d. The structure of the random access file is as follows:

<u>Record 1</u>

Record Word	Data Type	Data Description
1-20	Alphanumeric	Each word contains four alpha characters. The record contains a description of the terrain; e.g., "GERMANY BLUE ATTACK WOODED AREA".

<u>Record 2</u>

Record Word	Data Type	Data Description
1	Real	Percent Red dismounted visible to Blue dismounted, range 0-200m.
2	Real	Percent Red mortars visible to Blue dismounted, range 0-200m.
3	Real	Percent Red light armor visible to Blue dismounted, range 0-200m.

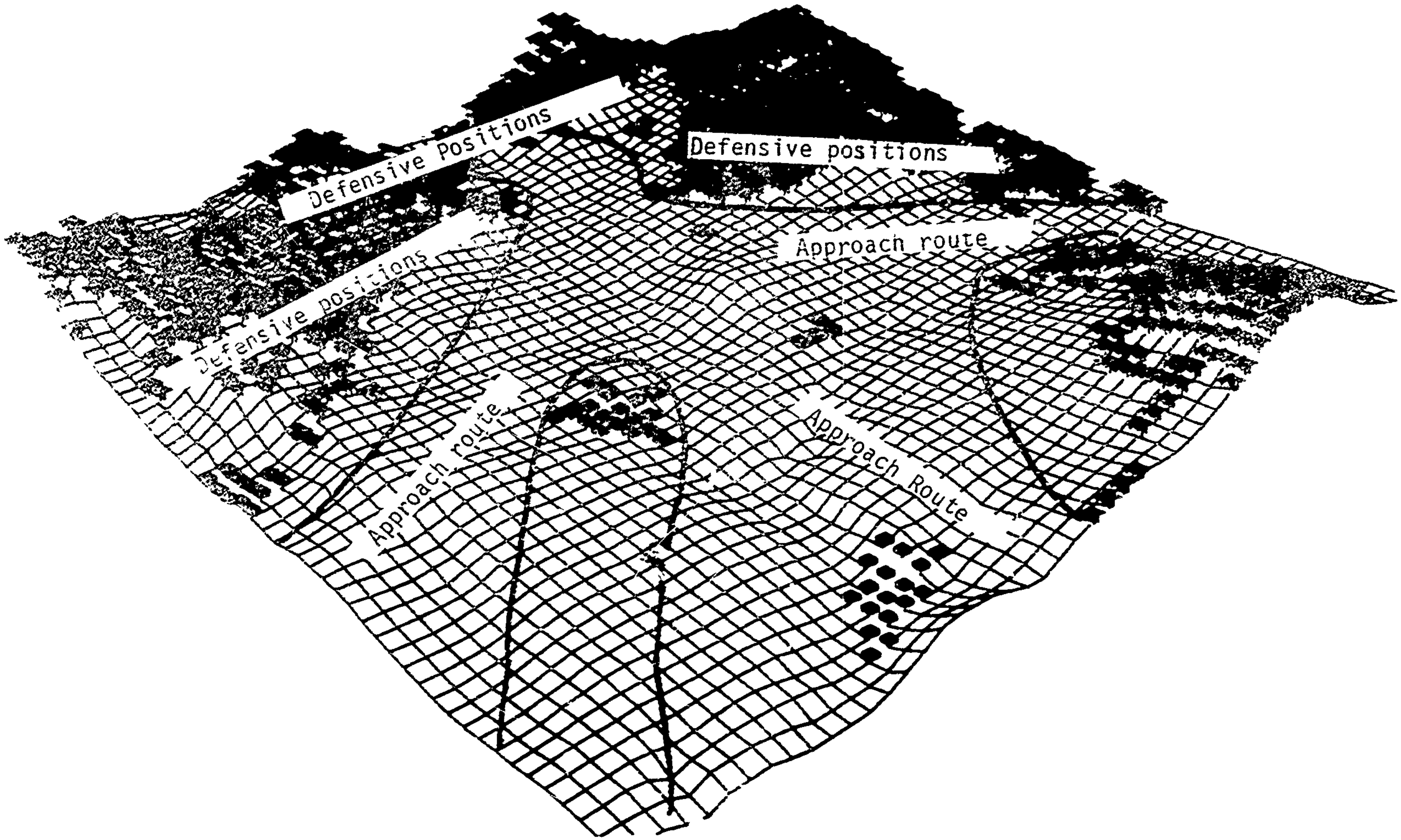

Figure 2-2. ½ t'e site.

Figure 2-3. Line-of-sight fan for a TOW position.

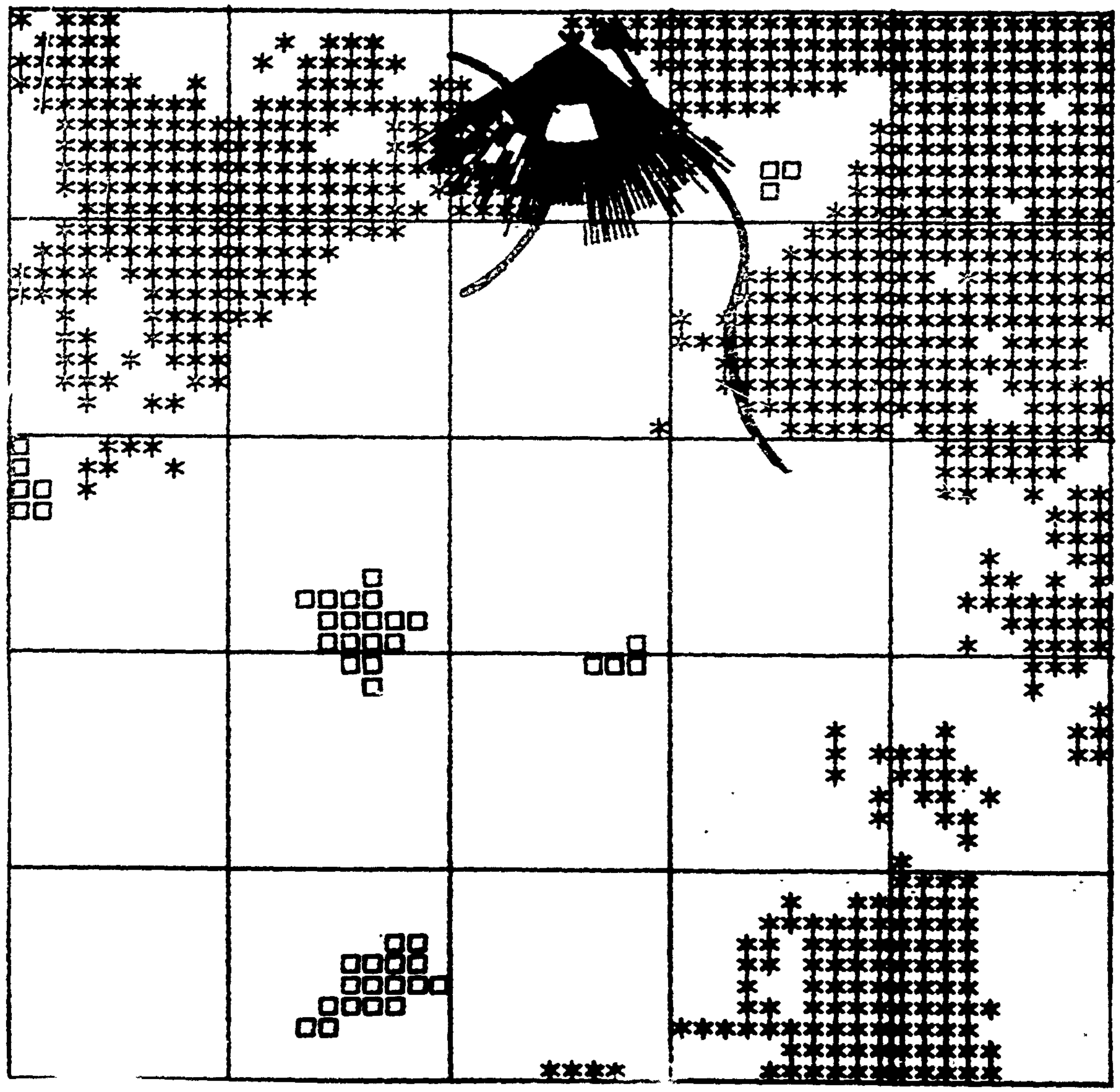

Figure 2-4. Line-of-sight fan for a small arms positions.

Record Word	Data Type	Data Description
4	Real	Percent Red heavy armor visible to Blue dismounted.
5-8	Real	Percent Red dismounted, mortars, light armor, heavy armor visible to Blue mortars.
9-12	Real	Percent Red dismounted, mortars, light armor, heavy armor visible to Blue light armor at 0-200m.
13-16	Real	Percent Red dismounted mortar, light armor, heavy armor visible to Blue heavy armor at 0-200m.

Records 3-6

Contain the same information for Red targets at ranges of 201-400, 401-600, 601-800, and 801-1000 meters.

Records 7-11

Contain the percent of Blue visible to Red during the engagement phase of the battle. The structure is similar to that used for records 2-6.

Records 12-21

Contain the percent of Red and Blue visible during Blue withdrawal. The structure is similar to that used for records 2-6.

Records 22-31

Contain the percent of Red and Blue visible during Red withdrawal. The structure is similar to that used for records 2-6.

Record 32

Contains the tactical offset distance of the centroids of the Blue weapons categories (dismounted personnel, mortars, light armor, heavy armor) from the Blue force centroid. It also contains similar Red tactical offset distances.

Record Word	Data Type	Data Description
1	Real	Tactical offset of Blue dismounted personnel from Blue force centroid (meters).

Record Word	Data Type	Data Description
2	Real	Tactical offset of Blue mortars (meters).
3	Real	Tactical offset of Blue light armor (meters).
4	Real	Tactical offset of Blue heavy armor (meters).
5	Real	Tactical offset of Red dismounted personnel from Red force centroid (meters).
6	Real	Tactical offset of Red mortars from Red force centroid.
7	Real	Tactical offset of Red light armor from force centroid (meters).
8	Real	Tactical offset of Red heavy armor from force centroid (meters).

Record 33

Contains the corridor width (meters) for the attacker.

Record Word	Data Type	Data Description
1	Real	Corridor width in meters at ranges of 0-200m from force centroid. The corridor is for attacking dismounted personnel.
2-5	Real	Corridor widths for dismounted personnel at ranges of 201-400m, 401-600m, 601-800m, 801-1000m.
6-10	Real	Corridor widths for mortars at ranges of 0-200m, 201-400m, 601-800m, 801-1000m.
11-15	Real	Corridor widths for light armor at range of 0-200m, 201-400m. 601-800m, 801-1000m.
16-20	Real	Corridor widths for heavy armor at ranges of 0-200m, 201-400m, 601-800m, 801-1000m.

Record 34

Contains the corridor widths for the defender withdrawing. The structure is identical to record 33.

Record 35

Contains the corridor widths for the attacker withdrawal routes. The structure is identical to record 33.

Record 36

Contains the maximum percent of weapons that will be lost before withdrawal. The numbers represent tactical decision thresholds upon which the unit commander bases the withdrawal decision.

Record Word	Data Type	Data Description
1	Real	Maximum percent of Blue dismounted lost before Blue withdrawal.
2	Real	Maximum percent of Blue mortars lost before Blue withdrawal.
3	Real	Maximum percent of Blue light armor lost before Blue withdrawal.
4	Real	Maximum percent of Blue heavy armor lost before Blue withdrawal.
5-8	Real	Maximum percent of Red dismounted, mortars, light armor, and heavy armor lost before Red withdrawal.

2-3. FILE STRUCTURE FOR WEAPON VULNERABILITY. The Weapon Vulnerability file is divided into two sections.

a. The first section contains 125 records describing the ability of 25 Blue weapons to kill 25 Red weapons in five range bands 0-200m, 201-400m, 401-600m, 601-800m, and 801-1000m. The records are structured as follows:

Record 1

Record Word	Data Type	Data Description
1	Alpha	Six-character name for Blue weapon 1.
2	Real	Probability of kill of Red weapon 1 by Blue weapon 1 at a range of 0-200m. (Probability of kill represents a catastrophic kill--both mobility and firepower).
3	Real	Probability of kill of Red weapon 2 by Blue weapon 1 at a range of 0-200m.
.	.	.
.	.	.
.	.	.
26	Real	Probability of kill of Red weapon 25 by Blue weapon 1 at a range of 0-200m.

Records 2-5

Describe the ability of Blue weapon 1 to kill 25 Red weapons in the remaining four range bands. The first 125 records on the file are required to describe all 25 Blue weapons.

b. The second section of this file, records 126 through 250, contains probabilities of kill for Red weapons firing against Blue targets. These records are structured the same as the Blue lethality records. This file is read in DIAM by subroutine PKIN.

2-4. FILE STRUCTURE FOR WEAPON MOVEMENT RATES.

a. Data in the Movement Rates file is used by DIAM to advance four attacker categories during the engagement phase of the battle and to move the withdrawing systems during the withdrawal phase of the battle. The rates represent rates of advance achievable under unsuppressed conditions. The rates are adjusted by DIAM to represent the suppressive effects of personnel and vehicular losses. The movement rate data must be described in meters per minute.

b. The file contains rates for four weapon categories (dismounted personnel, mortars, light armor, heavy armor) on two terrains (open and heavily vegetated). The file is structured into three sections keying on three visibility conditions (clear day, clear night, and heavily obscured day).

(1) The first section consists of two records describing Blue and Red movement rates on a clear day (visibility range greater than 15km). The records are structured as follows:

Record 1

Record Word	Data Type	Data Description
1	Real	Movement rate of dismounted Blue in open terrain (meters/min).
2	Real	Movement rate of Blue mortars in open terrain (meters/min).
3	Real	Movement rate of Blue light armor in open terrain (meters/min).
4	Real	Movement rate of Blue heavy armor in open terrain (meters/min).
5-8	Real	Movement rate of Blue dismounted, mortars, light armor, and heavy armor in close, heavily vegetated terrain.

Record 2

Describes Red's movement in open and close terrain on a clear day.

(2) The second section contains two records describing Blue and Red movement rates at night. The form of records 3 and 4 is identical to records 1 and 2.

(3) The third section contains two records describing Blue and Red movement rates on a heavily obscured day (visibility range of 500 meters). The form of records 5 and 6 is identical to records 1 and 2.

2-5. FILE STRUCTURE FOR TARGET ACQUISITION RATES.

a. The Target Acquisition file data describe the ability of four generic sensor types to detect four types of targets at various ranges. The generic sensor types are unaided eye, optically aided eye, far infrared thermal imager, and image intensifier device. The targets being detected are personnel fully exposed, personnel in foxholes, armored vehicles fully exposed, and armored vehicles in hull defilade. The data represent average times for each sensor to detect each target at various ranges. The file is divided into three sections. Each section represents detection capabilities under conditions of clear day, clear night, and obscured night.

b. The first section, representing clear day, is structured as follows:

Record 1

Record Word	Data Type	Data Description
1	Real	Average time for Blue eye to detect a fully exposed vehicle at 0-200m (min/target).
2-4	Real	Average time for Blue eye to detect a hull defilade vehicle, fully exposed soldier, or soldier in defilade at 0-200m.
5-8	Real	Average time for a Blue optical system to detect four target types at 0-200m.
9-12	Real	Average time for a Blue thermal imager to detect four target types at 0-200m.
13-16	Real	Average time for a Blue image intensifier device to detect four target types at 0-200m.

Records 2-5

Consider Blue's ability to detect four Red targets on a clear day at target ranges of 201-400m, 401-600m, 601-800m, and 801-1000m. Their structure is identical to record 1.

Records 6-10

Contain detection times for four generic Red sensors to acquire four Blue targets in five equal range bands from 0 to 1000m. The structure of these records is identical to records 1-5.

c. The second section contains records 11-20. These records describe Blue and Red ability to detect targets on a clear night. The structure of these records is identical to records 1-10.

d. The third section contains records 21-30. These records describe Blue and Red ability to detect targets on an obscure day (visibility range 500m). The structure of these records is identical to records 1-10.

2-6. FILE STRUCTURE FOR WEAPONS CHARACTERISTICS.

a. The Weapons Characteristics file contains data describing the physical characteristics of 25 Blue systems and 25 Red systems. The data on each weapon system are used by the DIAM model to construct firing rates for each weapon. The file also contains pointers to the Movement Rates file and Target Acquisition file for each system, allowing DIAM to retrieve the proper movement and detection rates for each system.

b. The file is structured into two sections. The first section contains 25 records describing Blue weapon characteristics. The second section contains 25 records describing 25 Red weapons. The records have the following structure:

Record Word	Data Type	Data Description
1	Alpha	Six-character weapon name.
2	Integer	The type of primary sensor contained on this weapon: 1=eye, 2=optic, 3=thermal, 4=image intensifier.
3	Real	Round flight time of primary armament (seconds/200 meters).
4	Real	Number of rounds (bursts for burst fire systems) carried by this weapon.
5	Integer	Weapon platform movement category: 1=dismounted personnel, 2=mortars, 3=light armor, 4=heavy armor.
6	Real	Weapon firing cycle time. This represents the average time to aim, fire, and reload the weapon (seconds). Munition guidance time should not be included in this value.

The Blue weapons described in this file must be in the same order as their probability of kill records appear on the Weapon Vulnerability file.

CHAPTER 3

DIAM PROGRAM CODE

3-1. INTRODUCTION.

a. This chapter contains information on the DIAM program code. This introductory paragraph discusses programming philosophy, concepts, and techniques used in constructing the code for DIAM. The second paragraph describes the functional areas of DIAM and presents a system flowchart. The third paragraph contains figures and tables that briefly explain the subroutines called from each functional area and the primary variables influenced by each subroutine. Paragraph 3-4 explains the self-documenting concept used in DIAM with examples. Paragraph 3-5 contains the DIAM code as a subroutine called by subroutine INFANT of Jiffy.

b. The following guidelines were used in developing the DIAM code to allow for easier understanding, maintenance, and modification of the DIAM model.

(1) First, all subroutines are no longer than 150 lines and are functional in application. Efforts were made to keep the length around 50 lines, and only a few subprograms are over 80 lines. The biggest exception is the main DIAM subroutine, which is around 500 lines. However, this main subroutine consists of functional areas or separate procedures of less than 50 lines each.

(2) Second, the DIAM structure is basically two-level. Only the main DIAM subroutine passes control to and from each subroutine in a top-down process. (A third level is occasionally used when subroutine INIT is called to initialize an array.) This design allows for easier understanding of structure flow than do higher level structures.

(3) Third, the DIAM structure includes IF/THEN/ELSE statements, no common blocks, and self-documenting code. IF/THEN/ELSE programming avoids "GO TO" programming; with proper indentation this makes the structure flow easier to understand. No common blocks allows better control of debugging and testing. The self-documenting technique, explained in paragraph 3-4, was used to facilitate understanding, debugging, and future modification of the DIAM code. With this technique, each subroutine contains all information and only that information needed to understand the function of the subroutine.

3-2. DIAM FUNCTIONAL AREAS.

This section contains a brief overview of the functional areas in DIAM. Figure 3-1 is a functional flow diagram of the model.

a. As shown in the figure, the low resolution data are loaded first. Since DIAM's first implementation was in conjunction with the Jiffy Model, the low resolution data are received from Jiffy. These data could be loaded by subroutine calls from the main DIAM subroutine if DIAM were used with other models or executed independently. The low resolution data include Blue and

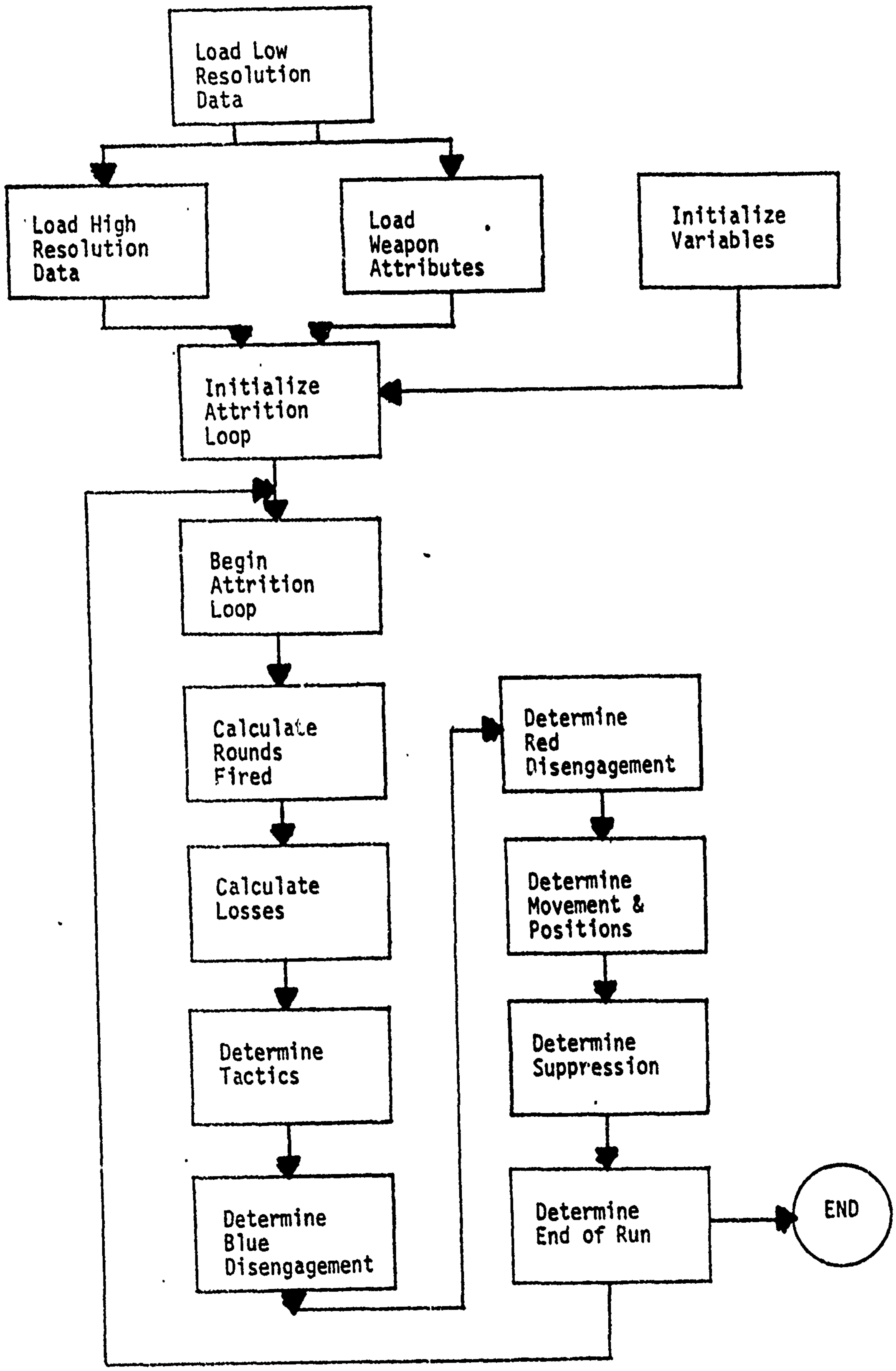

Figure 3-1. Flow chart of DIAM module.

Red weapon systems and scenario information. Predetermined artillery losses from Jiffy are also included, but artillery could be modeled differently in DIAM for different applications.

b. After a gamer selects the type and number of weapon systems and a tactical scenario from the DIAM library, the DIAM model selects the appropriate high resolution data and weapon attributes.

(1) The high resolution data contain terrain information for both forces, including visibility factors, attacker corridor widths, and disengagement criteria. This information is contained in a library and is accessed by the type of tactical scenario. Currently, the library contains terrain data for only a few terrain types. These scenarios require minimal set-up time (approximately 2 days). In the future as many as 30 scenarios will be available for access.

(2) The weapon attributes selected are from a data base developed for all possible weapons played in DIAM. DIAM allows a maximum of 10 weapons per side in a run. Weapon attributes include probability of kill, weapon characteristics, movement rates, and detection times for all Red and Blue weapon types selected for a given scenario.

c. The next two functional areas are initialization procedures. The first procedure initializes variables, arrays, indexes, and counters. The second procedure initializes ammunition loads, artillery losses per minute from Jiffy, and distances from the force centroid to its weapons for both Red and Blue forces. Defending minefields can then be entered, and the force visibility tables are initialized. Both forces are entered as dismounted forces. The attacking force then mounts its vehicles after the number of troops to mount is determined, and the attrition calculations are ready to begin.

d. The attrition loop starts by determining the distance between Red and Blue weapon types and their respective range bands. The range bands are then used to determine the visibility factors and the probability of kill between Red and Blue weapon types during the current minute.

e. Using this information, the next procedure calculates rounds fired by each Red and Blue weapon type. The results are calculated by a sequence of subroutines that first determines number of engageable targets, time to engage targets, rounds to kill targets, and time to kill targets. From this information, the projected rounds required to kill all engageable targets for each weapon type are calculated. These rounds are limited in the final subroutine to one-fourth the available ammunition to determine the actual rounds fired.

f. The next functional area calculates total Red and Blue weapon type losses during the minute. The primary attrition loss calculation occurs in the first two subroutines using the equations developed in chapter 1 where

initial losses, and then total expected losses, are calculated for all weapon types. Artillery and minefield losses are then determined before the mounted infantry personnel losses are calculated. Mounted personnel losses are determined from the losses of troop carriers and proportioned uniformly across the number of personnel inside the troop carriers. The Red and Blue losses are tallied, and the remaining Red and Blue weapon types are determined. The last subroutine of this procedure generates a killer/victim scoreboard for both Red and Blue weapon types.

g. New tactics are determined in the next procedure. Currently, DIAM plays two tactical modes: infantry personnel can dismount troop carriers at a chosen distance from the opposing force, and a percentage of armor vehicles can go into overwatch, also at a chosen distance. After new tactics are determined a killer/victim report is generated for the gamer at chosen minute intervals. The gamer then has the option of continuing the engagement or withdrawing one of the forces.

h. The next two procedures determine if Red or Blue forces disengage. As mentioned previously, the gamer can trigger a withdrawal. If not, attrition losses are checked every minute, and a force will disengage at a chosen attrition loss level. At this point, the gamer can again override the disengagement and continue the battle. Hence, in DIAM the gamer can have complete control of engaging and withdrawing forces or allow the battle to automatically disengage forces at chosen attrition levels.

i. New positions are calculated after disengagement is determined. The attacker moves forward if engaging or pursuing the withdrawing defender. The defender always remains stationary unless withdrawing.

j. One of the last procedures calculates fire and movement suppression for Red and Blue forces. This procedure is processed last since suppression is calculated as losses received divided by losses inflicted for each weapon type. During the first minute fire suppression is assumed to be 50 percent. Currently, suppression in DIAM is consistent with the method of suppression play in Jiffy where firepower ratios are used.

k. Finally, the last procedure determines if the attrition loop continues or ends. Currently, 1000 minutes is the limit during Red and Blue engagement. When either force is withdrawing the battle continues 10 minutes before ending.

3-3. SUBROUTINE SUMMARY. Table 3-1 provides a cross-referenced summary of the DIAM subroutines and their primary variables. Subroutines called by each functional area are shown, and the function of each subroutine is described. The primary variables for each subroutine are listed and described.

3-4. DIAM SELF-DOCUMENTATION CONCEPT. This paragraph explains the self-documenting technique and variable name convention used in DIAM.

Table 3-1. DIAM Subroutine Summary (continued next page)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Load Low Resolution Data	LRDT	Initializes Blue and Red force types and tactics and defense posture.	BFRCTP	Blue force type index
			RFRCTP	Red force type index
			DPSTR	Defense posture index
			TACA	Tactics array
Load High Resolution Data	TERIN	Loads arrays containing visibility factors by weapon categories. Loads corridor widths of forces by weapon categories. Loads distance between force and force weapon categories.	PCRVBE	Percent Red visible to Blue during engagement
			PCRVBW	Percent Red visible to Blue withdrawing
			PCRWVB	Percent Red withdrawing visible to Blue
			PCBVRE	Percent Blue visible to Red during engagement
			PCBVRW	Percent Blue visible to Red withdrawing
			PCBWVR	Percent Blue withdrawing visible to Red
			DFCWC	Offset distance between force centroid and weapon category centroid
			*AWDTH	Corridor width for attacking force
			*BWDTH	Corridor width for withdrawing Blue force
			*RWDTH	Corridor width for withdrawing Red force
			DGMATT	Disengagement attrition levels for weapon categories
Load Weapon Attributes	PKIN	Loads array containing probability of kill for Blue and Red weapons. Loads Blue and Red weapon characteristics.	BRPK	SSPK for Blue vs Red Targets
			RBPK	SSPK for Red vs Blue Targets
			BCHR	Blue weapon characteristic array
			RCHR	Red weapon characteristic array
	MOVIN	Loads arrays containing Red and Blue movement rates and detection times.	BMVRT	Blue movement rate
			RMVRT	Red movement rate
			BDTCT	Blue detection times
			RDTCT	Red detection times

*Currently not used

Table 3-1. (continued)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Initialize Arrays and Variables	INDX1	Initializes counters, flags, and variables used in attrition loop.	DFRC	Defending force index
			BDFAT	Blue defending/attacking index
			RDFAT	Red defending/attacking index
			BDMNUM	Number of Blue dismounted infantry allowed in carrier
			RDMNUM	Number of Red dismounted infantry allowed in carrier
			BDMV	Blue dismount index
			RDMV	Red dismount index
			BOVWTH	Blue overwatch index
			ROVWTH	Red overwatch index
			BWDRW	Blue withdrawal index
			RWDRW	Red withdrawal index
	INDX2		KNTMNT	Minute counter for DIAM battle
			KWDMNT	Minute counter for withdrawal
			FPFTM	Minute counter for final protective fires
			BDSNG	Blue disengage index
			RDSNG	Red disengage index
			AMFLD	Minefield characteristic array
			BFLSFR	Blue false fire factor
			RFLSFR	Red false fire factor
			BHOLDS	Blue holding position index
			RHOLDS	Red holding position index
	INIT1	Initializes any 10x2 array.	ARRAY	Array to be initialized
			VAR	Value initialized for array

Table 3-1. (continued)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Initialize Attrition Loop	BSETLD	Initializes ammunition loads for Blue weapons.	BAMO	Ammunition loads for Blue weapon types
	RSETLD	Initializes ammunition loads for Red weapons.	RAMO	Ammunition loads for Red weapon types
	INTART	Initializes artillery losses from Jiffy.	BARTJF RARTJF	Blue artillery loss array from Jiffy Red artillery loss array from Jiffy
	INTDST	Initializes distances from force centroid to force weapon types.	DBFBWP	Distance from Blue force centroid to Blue weapon types
	MINCHR	Initializes defending minefield parameters and loss rates.	AMFLD AMLSR FMNFD BMNFD	Minefield characteristic array Minefield loss rates Location of front edge of minefield Location of rear edge of minefield
	PCTBL	Chooses two of the six available visibility tables based on force engagement or withdrawal.	PCBVRC PCRVBC	Percent of Blue weapon categories visible to Red weapon categories Percent of Red weapon categories visible to Blue weapon categories
	DMRTO	Calculates ratio of dismounted troops to troop carriers.	BDMRTO RDMRTO	Blue ratio of dismounted infantry to troop carriers Red ratio of dismounted infantry to troop carriers
	REMNT	Mounts dismounted infantry into troop carriers.	RDMV RNUMDM BDMV BNUMDM	Red dismount index Number of Red troops mounted per carrier Blue dismount index Number of Blue troops mounted per carrier

Table 3-1. (continued)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Begin Attrition Loop	WPNDST	Determines distance from Blue weapon types to Red weapon types.	DBWRWP	Distance from Blue weapon types to Red weapon types
			DRWBWP	Distance from Red weapon types to Blue weapon types
			DSTMIN	Minimum distance between Red and Blue weapon types
	RNGBND	Determines range bands from Blue weapon types to Red weapon types.	BRRGBD	Range band from Blue weapon type to Red weapon type
			RBRGBD	Range band from Red weapon type to Blue weapon type
	PCWPVS	Determines fraction of Red and Blue weapon types visible to Blue and Red weapon types.	PCBVRZ	Percent of Blue weapon types visible to Red weapon types
			PCRVBZ	Percent of Red weapon types visible to Blue weapon types
	PKWP	Determines SSPK for Blue vs Red and Red vs Blue weapon types.	BRPKW	SSPK for Blue firers vs Red target types
			RBPKW	SSPK for Red firers vs Blue target types
Calculation of Rounds Fired	NUMTGT	Calculates total number of Red and Blue engageable target types.	TOTRTG	Total number of Red engageable target types
			TOTBTG	Total number of Blue engageable target types
	TIMENG	Determines time to engage Red and Blue target types.	BTMENG	Blue time to engage Red target types
			RTMENG	Red time to engage Blue target types
	RNDKLL	Calculates rounds to kill Red and Blue target types.	BRDKLL	Number of Blue rounds to kill Red targets types
			RRDKLL	Number of Red rounds to kill Blue target types
	TMKLL	Calculates time to kill Blue and Red target types.	BTMKLL	Blue time to kill Red target types
			RTMKLL	Red time to kill Blue target types

Table 3-1. (continued)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Calculation of Rounds Fired (Cont)	RNDFRD	Calculates projected Blue and Red rounds fired.	BRDFR RRDFR	Rounds fired by Blue weapon types Rounds fired by Red weapon types
	RNDCK	Calculates actual rounds fired based on remaining ammunition loads.	BRDFR BAMO BRDSUM RRDFR RAMO RRDSUM	Rounds fired by Blue weapon types Ammunition loads of Blue weapon types Sum of rounds of Blue weapon types Rounds fired by Red weapon types Ammunition loads of Red weapon types Sum of rounds of Red weapon types
Calculation of Total Losses	ECLOSS	Calculates expected Blue and Red committee losses.	EBCLSS ERCLSS	Expected committee losses of Blue weapon types Expected committee losses of Red weapon types
	ETLOSS	Calculates total expected Blue and Red losses	EBTLSS ERTLSS	Total expected losses of Blue weapon types Total expected losses of Red weapon types
	ARTLSS	Calculates artillery losses for Red and Blue weapon types.	BARTLS RARTLS	Artillery losses for Blue weapon types Artillery losses for Red weapon types
	MNLSS	Calculates mine losses for Blue and Red weapon types.	BMNLSS RMNLSS	Mine losses for Blue weapon types Mine losses for Red weapon types
	DMSLSS	Calculates Red and Blue dismounted losses.	EBTLSS ERTLSS BARTLS RARTLS BMNLSS RMNLSS	See above
	TALLY	Cumulates total Red and Blue weapon type losses.	BDEAD RDEAD	Total Blue weapon type losses Total Red weapon type losses
	JFLSS	Calculates killer/victim scoreboard for Red and Blue weapon types for Jiffy gamers.	BRKVLS RBKVLS	Blue killer/Red victim weapon type loss table Red killer/Blue victim weapon type loss table

Table 3-1. (continued)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Determination of New Tactics	TACDSM	Determines if attacking force dismounts.	BDMV RDMV	Blue force dismount index Red force dismount index
	TACOVW	Determines if attacking force goes into overwatch status.	BOVWTH ROVWTH	Blue force overwatch index Red force overwatch index
	REPRT	Displays report to gamers. Includes killer/victim scoreboard, minimum distance between forces, and asks gamer to continue or withdraw forces.	BDSNG RDSNG	Blue force disengage index Red force disengage index
Determination of Blue Force Disengagement	DSNG	Determines if Blue force disengages based on attrition losses. If Blue force is to disengage, then subroutines PCTBL, DMRTO, REMNT are called (See Initialize Attrition Loop functional area).	BWDRW BHOLDS	Blue force withdrawal index Blue hold position index
Determination of Red Force Disengagement	DSNG	Determines if Red force disengages based on attrition losses. If Red force is to disengage, then subroutines PCTBL, DMRTO, REMNT are called. (See Initialize Attrition Loop functional area).	RWDRW RHOLDS	Red force withdrawal index Red hold position index
Determination of Movement Rates and Positions	MVRT	Determines movement rates for Red and Blue weapon types.	BWPMVR RWPMVR	Blue weapon type movement rate Red weapon type movement rate
	NDIST	Calculates new distances between a force and its weapon types.	DBFBWP DRFRWP	Distance between Blue force centroid and Blue weapon types Distance between Red force centroid and Red weapon types

Table 3-1. (concluded)

Functional Area	Subroutines Called	Subroutine Function	Primary Variables	Primary Variable Description
Calculation of Fire and Movement Suppression	ARTSP	Calculates Blue and Red artillery losses for suppression only.	BARTSP	Blue weapon type artillery losses used only for suppression calculation
			RARTSP	Red weapon type artillery losses used only for suppression calculation
	SPDG	Calculates Blue and Red fire and movement suppression degradation factors.	BSPFDG	Blue weapon type fire suppression degradation
			RSPFDG	Red weapon type fire suppression degradation
			BSPMDG	Blue weapon type movement suppression degradation
			RSPMDG	Red weapon type movement suppression degradation
Check for End of Module Run	REPRT	This procedure checks and adds minute counters and returns control to Jiffy after a force has withdrawn 10 minutes (See Determination of New Tactics Functional Area).	KWDMNT	Minute counter for withdrawal
			KNTMNT	Minute counter for engagement

a. The main program is sectioned into functional areas or procedures and, with comment statements, is self-explanatory. The main program's primary function is to call subroutines. Each subroutine begins with a brief description of the purpose. When a subroutine is called from the main program, the parameters in the calling statement are listed so that returning variables are at the end of the argument list. All parameters are explained in the subroutine called.

b. The following variable name convention was adopted for single and dual purpose subroutines. Single purpose subroutines are those that receive only one set of parameters from the call statements of the main program. For single purpose subroutines, the parameters match the calling parameters of the main program. Dual purpose subroutines are those that receive two sets of parameters from the main program. In the first case, the set of parameters will be Blue force variables that contain Blue force information in relation to Red. In the second case, the set of parameters will be Red force variables that contain Red force information in relation to Blue. To represent both cases the variable name convention in the subroutines results in "X" force variables that contain "X" force information in relation to "Y" force information.

c. Figures 3-2 and 3-3 show subroutines INDX2 and RNDKLL, a single purpose subroutine and a dual purpose subroutine, respectively, being called from the main program. The dual purpose subroutine RNDKLL is called twice, once to determine Blue rounds to kill Red targets and again to determine Red rounds to kill Blue targets. The first time the main program passes Blue and Red arrays to interpret "X" force for Blue force and "Y" force for Red force variables. The second time the main program passes Blue and Red arrays to interpret "X" force for Red force and "Y" force for Blue force variables.

d. A knowledge of the tactics currently played in DIAM is required to understand most variable names and array variables. All weapons played in DIAM are categorized in one of four groups: dismounted infantry, mortars, light armor, and heavy armor. Two tactical modes are played by the weapons: mounted/dismounted for troops and carriers, and heavy armor in overwatch. Table 3-2 shows the tactical modes for weapons in each weapon category.

```
C    INITIALIZE ARRAYS AND VARIABLES
C
C      DETERMINE INDEXES FOR BLUE AND RED FORCES
         CALL INDX1(DFHC,BDFAT,RDFAT,BFRCTP,BDMMAX,RDMMAX,
     1     BWDRW,RWDRW,BDMV,RDMV,BOVWTH,ROVWTH)
         CALL INDX2(KNTMNT,KWDMNT,FPFTM,BDSNG,RDSNG,AMFLD,
     1     BDFAT,BFLSFR,RFLSFR,BHOLDS,RHOLDS)
C********************   SUBROUTINE INDX2   **********************
C
C
C
      SUBROUTINE INDX2(KNTMNT,KWDMNT,FPFTM,BDSNG,RDSNG,AMFLD,
     1                     BDFAT,BFLSFR,RFLSFR,BHOLDS,RHOLDS)
C
C      THIS SUBROUTINE INITIALIZES THE FOLLOWING VARIABLES AND
C        INDEXES
C
C      KNTMNT     MINUTE COUNTER FOR DIAM BATTLE
C      KWDMNT     MINUTE COUNTER DURING WITHDRAWAL IN DIAM
C      FPFTM      MINUTE COUNTER FOR FINAL PROTECTIVE FIRES
C      BDSNG      INDEX FOR X FORCE:  1=ENGAGING, 2=DISENGAGING
C      RDSNG      INDEX FOR Y FORCE:  1=ENGAGING, 2=DISENGAGING
C      AMFLD(1)   INDEX FOR MINES IN USE: 0=NO, 1=YES
C      AMFLD(2)   MINEFIELD WIDTH
C      AMFLD(3)   MINEFIELD FRACTION NOT BYPASSED
C      AMFLD(4)   FRACTION OF ATTACKING FORCE ENTERING MINEFIELD
C      BFLSFR     FALSE FIRING FACTOR FOR BLUE FORCE
C      RFLSFR     FALSE FIRING FACTOR FOR RED FORCE
C      BDFAT      INDEX FOR BLUE FORCE:  1=DEFENDING, 2=ATTACKING
C      BHOLDS     INDEX FOR BLUE FORCE:  1=BLUE FORCE HOLDS POSITION,
C                 2=BLUE IS ALLOWED TO WITHDRAW
C      RHOLDS     INDEX FOR RED FORCE:  1=RED FORCE HOLDS POSITION,
C                 2=RED IS ALLOWED TO WITHDRAW
      DIMENSION AMFLD(4)
C     INITIALIZE VARIABLES:
        KNTMNT=1
        KWDMNT=0
        FPFTM=0
        BDSNG=1
        RDSNG=1
        BHOLDS=2
        RHOLDS=2
C
        DO 10 I=1,4
          AMFLD(I) = 0
10      CONTINUE
C
      IF(BDFAT.EQ.1)THEN
        BFLSFR = 0.8
        RFLSFR = 0.4
      ELSE
        BFLSFR = 0.4
        RFLSFR = 0.8
      END IF
C
      RETURN
        END
```

Figure 3-2. Single purpose subroutine

```
C     CALCULATE ROUNDS TO KILL RED TARGET TYPES
C       FOR BLUE WEAPON TYPES
        CALL RNDKLL(BRPKW,BRDKLL)
C
C     CALCULATE ROUNDS TO KILL BLUE TARGET TYPES
C       FOR RED WEAPON TYPES
        CALL RNDKLL(RBPKW,RRDKLL)


C************************ SUBROUTINE RNDKLL *****************
C
C
C
      SUBROUTINE RNDKLL(XYPKW,XRDKLL)
C
C     THIS SUBROUTINE CALCULATES XRDKLL(I,M,J), ROUNDS TO KILL
C       FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2
C       AGAINST Y FORCE TARGET TYPES M OF WHICH M=11,20
C       ARE IN TACTICAL MODE 2
C
C     XYPKW(I,M,J)    PROBABILITY OF KILL (SSPK) FOR X FORCE
C                     WEAPON TYPES I IN TACTICAL MODE J=1,2
C                     AGAINST Y FORCE TARGET TYPE M OF
C                     WHICH M=11,20 ARE IN TACTICAL MODE 2
C
C
      DIMENSION XYPKW(10,20,2),XRDKLL(10,20,2)
C
C
100   DO 10 J=1,2
        DO 20 I=1,10
          DO 30 L=1,2
            DO 40 M=1,10
C
              PK=XYPKW(I,M+(L-1)*10,J)
              IF(PK.GT.0) THEN
                RDKLL=1/PK
              ELSE
                RDKLL=0
              END IF
              XRDKLL(I,M+(L-1)*10,J) = RDKLL
C
40          CONTINUE
30        CONTINUE
20      CONTINUE
10    CONTINUE
C
      RETURN
      DEBUG SUBCHK
      AT 100
      END
```

Figure 3-3. Dual purpose subroutine

Table 3-2. Tactical modes for each weapon category

Weapon Category	Tactical Mode (1)	Tactical Mode (2)
Dismounted Infantry	Mounted in troop carriers	Not in troop carriers
Light/Troop Carriers	Troop carriers mounted	Troop carriers dismounted
Light/Non-Troop Carriers	(Engaging)	-999 as non-troop carrier flag
Heavy	Not in overwatch	In overwatch
Mortars	(Engaging)	N/A

3-5. DIAM CODE. This section contains the DIAM code interfaced with Jiffy. Some features of this DIAM version are unique to Jiffy. For example, most of the low resolution data or gamer input for DIAM is implemented by the subroutine Jiffy before DIAM is called by INFANT. Blue and Red weapons from the Jiffy element array are chosen. The arrays IBNFID and IRDFID contain the Jiffy weapon pointers, a mounted or dismounted flag, a non-carrier flag, and a secondary weapon flag for each of the weapon types chosen. Artillery losses from Jiffy are added back to the weapons played in DIAM. Then DIAM reapportions the artillery losses each minute of battle. The DIAM code as shown has been tested and is currently being used to support war game studies with good results.

DIAMPUBLISH.DIAMMAIN
R1 04/01/82-10:33(0,)

```
C********************  SUBROUTINE DIAMMAIN  ********************
C
C
C
      SUBROUTINE DIAM(RBKVLS,BRKVLS,SHOTSI,IRPTM,IBAT,K25,K15,K20,
     1              K27,IOBS,TRNTP,DFRC,AFRC,BWPN,RWPN,BARTJF,
     1              RARTJF,ARPAM,BNUM,RNUM,IBU,IRD,IBNFID,
     1              IRNFID,IU,DSTBR)
C
C
      COMMON/RECDZ/DAY1,XINX(4),ICARD(20),IHY,IHN,IHB,IHYES,IHNO
C
C
      DIMENSION BWPN(10,3),RWPN(10,3),DGMATT(4,2),BARTJF(10,4)
     1,RARTJF(10,4),ARPAM(8),AMFLD(4),AMLSR(4),AWDTH(4,5)
     2,BWDTH(4,5),RWDTH(4,5),SHOTSI(10,2),PREP(2),IBU(10)
     3,IRD(10),BAMO(10,2),RAMO(10,2),IBNFID(25,4),IRNFID(25,4)
C
     2,PCRVBE(4,4,5),PCRVBW(4,4,5),PCRWVB(4,4,5),PCBVRE(4,4,5)
     3,PCBVRW(4,4,5),PCBWVR(4,4,5),DFCWC(4,2)
C
     4,BRPK(10,10,5),RBPK(10,10,5),BCHR(10,5),RCHR(10,5)
     5,BMVRT(4,2),RMVRT(4,2),BDTCT(4,4,5),RDTCT(4,4,5),TACA(2,3)
C
     6,BDEAD(10,2),RDEAD(10,2),BSPFDG(10,2),RSPFDG(10,2)
     7,BSPMDG(10,2),RSPMDG(10,2),BMNLSS(10,2),RMNLSS(10,2)
     8,BRDSUM(10,2),RRDSUM(10,2)
C
     9,DBFBWP(10,2),DRFRWP(10,2),PCBVRC(4,4,5),PCRVBC(4,4,5)
C
     1,DBWRWP(10,20,2),BRRGBD(10,20,2),RBRGBD(10,20,2)
     2,PCBVRZ(10,20,2),PCRVBZ(10,20,2),BRPKW(10,20,2)
     3,RBPKW(10,20,2),DRWBWP(10,20,2)
C
     4,TOTRTG(10,2),TOTBTG(10,2)
     5,BTMENG(10,20,2),RTMENG(10,20,2),BRDKLL(10,20,2)
     6,RRDKLL(10,20,2),BTMKLL(10,20,2),RTMKLL(10,20,2)
     7,BRDFR(10,20,2),RRDFR(10,20,2)
C
     8,EBCLSS(10,20,2),ERCLSS(10,20,2),ERTLSS(10,2),EBTLSS(10,2)
     9,BWPMVR(10,2),RWPMVR(10,2),BARTLS(10,2),RARTLS(10,2)
     1,BARTSP(10,2),RARTSP(10,2),BRKVLS(12,13),RBKVLS(12,13)
C
C
C
C    LOAD LOW RESOLUTION DATA
C
C      INITIALIZE THE REST OF LOW RESOLUTION DATA
1         CALL LRDI(BFRCTP,RFRCTP,DPSTR,TACA)
C
C
C
C    LOAD HIGH RESOLUTION DATA
C
C      LOAD PERCENT VISIBLE TABLES, DISTANCES, AND CORRIDOR WIDTHS
          CALL IERIN(IBAT,K25,PCRVBE,PCRVBW,PCRWVB,PCBVRE,PCBVRW,
     1        PCBWVR,DFCWC,AWDTH,BWDTH,RWDTH,DGMATT)
C
C
```

```
C
C    LOAD WEAPON ATTRIBUTES
C
C      LOAD PROBABILITY OF KILL AND WEAPON CHARACTERISTICS TABLES
         NUMB = BNUM
         NUMR = RNUM
         CALL PKIN(BRPK,RBPK,BCHR,RCHR,IBU,IRD,K15,K16,NUMP,NUMR,
     1      IU)
C
C      LOAD BLUE AND RED MOVEMENT RATES AND DETECTION DATA
         ITRNTP = TRNTP
         CALL MOVIN(IOPS,ITRNTP,K27,K20,BMVRT,RMVRT,BDTCT,RDTCT)
C
C
C
C    INITIALIZE ARRAYS AND VARIABLES
C
C      DETERMINE INDEXES FOR BLUE AND RED FORCES
         CALL INDX1(DFRC,BDFAT,RDFAT,BFRCIP,BDMMAX,RDMMAX,
     1      BWDRW,RWDRW,BDMV,RDMV,BOVWTH,ROVWTH)
         CALL INDX2(KNTMNT,KWDMNT,FPFTM,BDSNG,RDSNG,AMFLD,
     1      BDFAT,BFLSFR,RFLSFR,BHOLDS,RHOLDS)
C
       VAR=0.0
C        ZERO-OUT CUMULATIVE KILLS FOR BLUE WEAPON TYPES
           CALL INIT1(BDEAD,VAR)
C
C        ZERO-OUT CUMULATIVE KILLS FOR RED WEAPON TYPES
           CALL INIT1(RDEAD,VAR)
C
C        ZERO-OUT BLUE ARTILLERY LOSSES
           CALL INIT1(BARTLS,VAR)
C
C        ZERO-OUT RED ARTILLERY LOSSES
           CALL INIT1(RARTLS,VAR)
C
C        ZERO-OUT BLUE ROUNDS FIRED SUMMATION
           CALL INIT1(BRDSUM,VAR)
C
C        ZERO-OUT RED ROUNDS FIRED SUMMATION
           CALL INIT1(RRDSUM,VAR)
C
       VAR = 0.5
C        ZERO-OUT BLUE SUPPRESSION FIRE DEGRADATION
           CALL INIT1(BSPFDG,VAR)
C
C        ZERO-OUT RED SUPPRESSION FIRE DEGRADATION
           CALL INIT1(RSPFDG,VAR)
C
       VAR=0.0
C        ZERO-OUT BLUE SUPPRESSION MOVEMENT DEGRADATION
           CALL INIT1(BSPMDG,VAR)
C
C        ZERO-OUT RED SUPPRESSION MOVEMENT DEGRADATION
           CALL INIT1(RSPMDG,VAR)
C
C
C
C    INITIALIZE ATTRITION LOOP
C
C      INITIALIZE AMMUNITION LOADS FOR BLUE WEAPONS
```

```
            BSLD=1.0
            BSLDR=1.0
            CALL BSETLD(BNUM,IBU,BSLD,BSLDR,BCHR,IBNFID,BAMO)
      C
      C    INITIALIZE AMMUNITION LOADS FOR RED WEAPONS
            CALL RSETLD(RNUM,IRD,BSLD,BSLDR,RCHR,IRNFID,RAMO)
      C
      C    INITIALIZE ARTILLERY LOSSES FROM JIFFY
            CALL INTART(ARPAM,BARTJF,RARTJF)
      C
      C    INITIALIZE DISTANCE FROM BLUE FORCE CENTROID
      C      TO BLUE WEAPON TYPES
            IFRC=1
            CALL INTDST(IFRC,BCHR,BWPN,DFCWC,DBFBWP)
      C
      C    INITIALIZE DISTANCE FROM RED FORCE CENTROID
      C      TO RED WEAPON TYPES
            IFRC=2
            CALL INTDST(IFRC,RCHR,RWPN,DFCWC,DRFRWP)
      C
      C    DETERMINE MINEFIELD CHARACTERISTICS
            CALL MINCHR(AMFLD,FMNFLD,BMNFLD,DFCWC,DFRC,AMLSR)
      C
      C    DETERMINE THE VISIBLITY TABLES TO USE IN LOOP
            CALL PCTBL(BWDRW,RWDRW,DFRC,PCRVBE,PCRVBW,PCRWVB,
          1   PCBVRE,PCBVRW,PCBWVR,PCRVBC,PCBVRC)
      C
      C    DETERMINE NUMBER OF TROOPS TO MOUNT FOR ATTACKING FORCE
            IF(BDFAT.EQ.2 .AND. BDMV.EQ.2) THEN
              CALL DMRTO(BCHR,BWPN,BDMRTO)
              CALL REMNT(BCHR,BWPN,BDMMAX,BDMV,BDMRTO,BNUMDM,
          1     DBFBWP)
            ELSE IF(RDFAT.EQ.2 .AND. RDMV.EQ.2) THEN
              CALL DMRTO(RCHR,RWPN,RDMRTO)
              CALL REMNT(RCHR,RWPN,RDMMAX,RDMV,RDMRTO,RNUMDM,
          1     DRFRWP)
            ELSE
            END IF
      C
      C
      C
      C  BEGIN ATTRITION LOOP
      C
      C    DETERMINE DISTANCE FROM BLUE WEAPON TYPES
      C      TO RED WEAPON TYPES
      10    CALL WPNDST(DBFBWP,DRFRWP,DSTBR,BWPN,RWPN,DBWRWP,DSTMIN)
      C
      C    DETERMINE RANGE BANDS FOR BLUE WEAPON TYPES
      C      TO RED WEAPON TYPES
            CALL RNGBND(DBWRWP,BRRGBD)
      C
      C    DETERMINE DISTANCE AND RANGE BANDS FOR RED WEAPON
      C      TYPES TO BLUE WEAPON TYPES
            CALL RNGDST(BRRGBD,RBRGBD,DBWRWP,DRWBWP)
      C
      C    DETERMINE FRACTION OF BLUE WEAPON TYPES VISIBLE
      C      TO RED WEAPON TYPES
            CALL PCWPVS(BCHR,RCHR,PCBVRC,BRRGBD,PCBVR2)
      C
      C    DETERMINE FRACTION OF RED WEAPON TYPES VISIBLE
      C      TO BLUE WEAPON TYPES
```

```
      CALL PCWPVS(RCHR,BCHR,PCRVBC,RBRGBD,PCRVBZ)
C
C       DETERMINE SINGLE SHOT PROBABILITY OF KILL
C         FOR BLUE WEAPONS AGAINST RED TARGETS
          CALL PKWP(BRPK,BRRGBD,BRPKW)
C
C       DETERMINE SINGLE SHOT PROBABILITY OF KILL
C         FOR RED WEAPONS AGAINST BLUE TARGETS
          CALL PKWP(RBPK,RBRGBD,RBPKW)
C
C
C
C     CALCULATION OF ROUNDS FIRED BY WEAPON TYPE
C
C       CALCULATE TOTAL NUMBER OF ENGAGABLE RED TARGET TYPES
C         FOR BLUE WEAPON TYPES
          CALL INITI(TOTRTG,VAR)
          CALL NUMTGT(BRPKW,RWPN,PCRVBZ,RSPFDG,TOTRTG)
C
C       CALCULATE TOTAL NUMBER OF ENGAGABLE BLUE TARGET TYPES
C         FOR RED WEAPON TYPES
          CALL INITI(TOTBTG,VAR)
          CALL NUMTGT(RBPKW,BWPN,PCBVRZ,BSPFDG,TOTBTG)
C
C       CALCULATE TIME TO ENGAGE ALL RED TARGET TYPES
C         FOR BLUE WEAPON TYPES
          CALL TIMENG(BOVWTH,BRPKW,BRRGBD,BCHR,RCHR,BDFAT,
     1      BDTCT,BTMENG)
C
C       CALCULATE TIME TO ENGAGE ALL BLUE TARGET TYPES
C         FOR RED WEAPON TYPES
          CALL TIMENG(ROVWTH,RBPKW,RBRGBD,RCHR,BCHR,RDFAT,
     1      RDTCT,RTMENG)
C
C       CALCULATE ROUNDS TO KILL RED TARGET TYPES
C         FOR BLUE WEAPON TYPES
          CALL RNDKLL(BRPKW,BRDKLL)
C
C       CALCULATE ROUNDS TO KILL BLUE TARGET TYPES
C         FOR RED WEAPON TYPES
          CALL RNDKLL(RBPKW,RRDKLL)
C
C       CALCULATE TIME TO KILL RED TARGET TYPES
C         FOR BLUE WEAPON TYPES
          CALL TMKLL(BTMENG,BCHR,BRDKLL,BRRGBD,BTMKLL)
C
C       CALCULATE TIME TO KILL BLUE TARGET TYPES
C         FOR RED WEAPON TYPES
          CALL TMKLL(RTMENG,RCHR,RRDKLL,RBRGBD,RTMKLL)
C
C       CALCULATE PROJECTED ROUNDS TO FIRE BY BLUE WEAPONS
C         AGAINST RED TARGET TYPES
          CALL RNDFRD(BTMKLL,TOTRTG,BWPN,RWPN,PCBVRZ,PCRVBZ,
     1      BDFAT,BWDRW,BRDKLL,BSPFDG,RSPFDG,BRDFR)
C
C       CALCULATE PROJECTED ROUNDS TO FIRE BY RED WEAPONS
C         AGAINST BLUE TARGET TYPES
          CALL RNDFRD(RTMKLL,TOTBTG,RWPN,BWPN,PCRVBZ,PCBVRZ,
     1      RDFAT,RWDRW,RRDKLL,RSPFDG,BSPFDG,RRDFR)
C
C       CALCULATE ACTUAL ROUNDS FIRED BY BLUE WEAPONS
```

```
            CALL RNDCK(BWPN,BCHR,RCHR,BNUM,RNUM,BRDFR,BAMO,BRDSUM)
      C
      C     CALCULATE ACTUAL ROUNDS FIRED BY RED WEAPONS
            CALL RNDCK(RWPN,RCHR,BCHR,RNUM,BNUM,RRDFR,RAMO,RRDSUM)
      C
      C
      C
      C   CALCULATION OF TOTAL LOSSES
      C
      C     CALCULATE EXPECTED BLUE COMMITTEE LOSSES
            CALL ECLOSS(RBPKW,BWPN,PCBVRZ,RRDFR,RFLSFR,BSPFDG,EBCLSS)
      C
      C     CALCULATE EXPECTED RED COMMITTEE LOSSES
            CALL ECLOSS(BRPKW,RWPN,PCRVBZ,BRDFR,BFLSFR,RSPFDG,ERCLSS)
      C
      C     CALCULATE TOTAL EXPECTED DIRECT FIRE BLUE LOSSES
            CALL ETLOSS(BWPN,EBCLSS,EBTLSS)
      C
      C     CALCULATE TOTAL EXPECTED DIRECT FIRE RED LOSSES
            CALL ETLOSS(RWPN,ERCLSS,ERTLSS)
      C
      C     CALCULATE BLUE ARTILLERY LOSSES
            CALL ARTLSS(KNTMNT,ARPAM,BARTJF,BWPN,BCHR,BARTLS)
      C
      C     CALCULATE RED ARTILLERY LOSSES
            CALL ARTLSS(KNTMNT,ARPAM,RARTJF,RWPN,RCHR,RARTLS)
      C
      C     CALCULATE ATTACKER MINE LOSSES
            IF(BDFAT.EQ.2) THEN
              CALL MNLSS(AMFLD,AMLSR,AWDTH,DSTBR,FMNFLD,BMNFLD,
           1      BCHR,BWPN,DBFBWP,BMNLSS)
            ELSE
              CALL MNLSS(AMFLD,AMLSR,AWDTH,DSTBR,FMNFLD,BMNFLD,
           1      RCHR,RWPN,DRFRWP,RMNLSS)
            END IF
      C
      C     CALCULATE  MOUNTED INFANTRY LOSSES
            IF(BDMV.EQ.1) THEN
              CALL DSMLSS(BNUMDM,BWPN,BCHR,EBTLSS)
              CALL DSMLSS(BNUMDM,BWPN,BCHR,BARTLS)
              CALL DSMLSS(BNUMDM,BWPN,BCHR,BMNLSS)
            END IF
            IF(RDMV.EQ.1) THEN
              CALL DSMLSS(RNUMDM,RWPN,RCHR,ERTLSS)
              CALL DSMLSS(RNUMDM,RWPN,RCHR,RARTLS)
              CALL DSMLSS(RNUMDM,RWPN,RCHR,RMNLSS)
            END IF
      C
      C     CUMULATE TOTAL LOSSES FOR BLUE WEAPON TYPES
            CALL TALLY(BWPN,EBTLSS,BARTLS,BMNLSS,BDEAD)
      C
      C     CUMULATE TOTAL LOSSES FOR RED WEAPON TYPES
            CALL TALLY(RWPN,ERTLSS,RARTLS,RMNLSS,RDEAD)
      C
      C     CALCULATE BLUE TO RED KILLER VICTIM SCOREBOARD
            CALL JFLSS(RCHR,RWPN,ERCLSS,ERTLSS,RARTLS,RMNLSS,PRKVLS)
      C
      C     CALCULATE RED TO BLUE KILLER VICTIM SCOREBOARD
            CALL JFLSS(BCHR,BWPN,EBCLSS,EBTLSS,BARTLS,BMNLSS,PBKVLS)
      C
      C
```

```
C
C   DETERMINE NEW TACTICS
C
C     DETERMINE NEW TACTICAL MODE FOR BLUE FORCE
        IF(BDFAT.EQ.2 .AND. BWDRW.EQ.1) THEN
          IF(BDMV.EQ.1) THEN
            CALL TACDSM(BDMV,BCHR,RCHR,BWPN,DBFBWP,
     1          DBWRWP,TACA)
          END IF
          IF(BOVWTH.EQ.1) THEN
            CALL TACOVW(BOVWTH,BCHR,RCHR,BWPN,DBFBWP,
     1        DBWRWP,TACA)
          END IF
        END IF
C
C     DETERMINE NEW TACTICAL MODE FOR RED FORCE
        IF(RDFAT.EQ.2 .AND. RWDRW.EQ.1) THEN
          IF(RDMV.EQ.1) THEN
            CALL TACDSM(RDMV,RCHR,BCHR,RWPN,DRFRWP,
     1        DRWBWP,TACA)
          END IF
          IF(ROVWTH.EQ.1) THEN
            CALL TACOVW(ROVWTH,RCHR,BCHR,RWPN,DRFRWP,
     1        DRWBWP,TACA)
          END IF
        END IF
C
C
C     DISPLAY REPORT FOR GAMERS
        IF(((KNTMNT/IRPTM)*IRPTM-KNTMNT).EQ.0) THEN
          CALL REPRT(KNTMNT,RBKVLS,BRKVLS,BNUM,RNUM,BDEAD,
     1      RDEAD,BWPN,RWPN,BDSNG,RDSNG,BWDRW,RWDRW,BRDSUM,
     2      RRDSUM,DSTMIN)
C
        END IF
C
C
C
C   DETERMINE IF BLUE FORCE DISENGAGES
C
C     CHECK FOR BLUE DISENGAGEMENT
        IF(BWDRW.EQ.1 .AND. RWDRW.EQ.1) THEN
          IFRC=1
          CALL DSNG(BHOLDS,BDSNG,BWPN,BCHR,BDEAD,IFRC,DGMATT,BWDRW)
C
C         WHEN BLUE WITHDRAWS, THEN INITIALIZE NEW VISIBILITY
C         TABLES, REMOUNT FORCE, AND RELEASE OVERWATCH STATUS
            IF(BWDRW.EQ.2) THEN
              PRINT *,'BLUE TO WITHDRAW AT ',KNTMNT, ' MINUTES'
              PRINT *,'MINIMUM DISTANCE TO RED FORCE IS ',DSTMIN
              PRINT *,'DO YOU WISH TO WITHDRAW BLUE FORCES?'
              CALL REEDA(IANS)
              IF(IANS.EQ.1HY) THEN
                NWDMNT = KNTMNT
                CALL PCTBL(BWDRW,RWDRW,DFRC,PCRVBE,PCRVBW,PCRWVB,
     1            PCBVRE,PCBVRW,PCBWVR,PCRVBC,PCBVRC)
                IF(BDMV.EQ.2) THEN
                  CALL DMRTO(BCHR,BWPN,BDMRTO)
                  CALL REMNT(BCHR,BWPN,BDMMAX,BDMV,BDMRTO,BNUMDM,
     1              DBFBWP)
                END IF
```

```
                  IF(BOVWTH.EQ.2) THEN
                    BOVWTH = 1
                  END IF
                ELSE
                  BHOLDS = 1
                  BWDRW = 1
                  BDSNG = 1
                END IF
              END IF
            END IF
C
C
C
C    DETERMINE IF RED FORCE DISENGAGES
C
C      CHECK FOR RED DISENGAGEMENT
         IF(BWDRW.EQ.1 .AND. RWDRW.EQ.1) THEN
           IFRC=2
           CALL DSNG(RHOLDS,RDSNG,RWPN,RCHR,RDEAD,IFRC,DGMATT,RWDRW)
C
C          WHEN RED WITHDRAWS, THEN INITIALIZE NEW VISIBILITY
C          TABLES, REMOUNT FORCE, AND RELEASE OVERWATCH STATUS
             IF(RWDRW.EQ.2) THEN
               PRINT *,' RED TO WITHDRAW AT ',KNTMNT,' MINUTES'
               PRINT *,' MINIMUM DISTANCE TO BLUE FORCE IS ',DSTMIN
               PRINT *,' DO YOU WISH TO WITHDRAW RED FORCES?'
               CALL FEEDA(IANS)
               IF(IANS.EQ.1HY) THEN
                 NWDMNT = KNTMNT
                 CALL PCTBL(BWDRW,RWDRW,DFRC,PCRVBE,PCRVBW,PCRWVB,
     1             PCBVRE,PCBVRW,PCBWVR,PCRVBC,PCBVRC)
                 IF(RDMV.EQ.0) THEN
                   CALL DMRIO(RCHR,RWPN,RDMRIO)
                   CALL REMNT(RCHR,RWPN,RDMMAX,RDMV,RDMRIO,RNUMDM,
     1               DFFRWP)
                 END IF
                 IF(ROVWTH.EQ.2) THEN
                   ROVWTH = 1
                 END IF
               ELSE
                 RHOLDS = 1
                 RWDRW = 1
                 RDSNG = 1
               END IF
             END IF
           END IF
C
C
C
C    DETERMINE MOVEMENT RATES AND NEW POSITIONS
C
C      DETERMINE MOVEMENT RATES FOR EACH BLUE WEAPON TYPE
         CALL MVRT(BOVWTH,BDFAT,BWDRW,TRNTP,BCHR,BWPN,
     1     BMVRT,BWPMVR)
C
C      CALCULATE NEW DISTANCE FROM BLUE FORCE CENTROID
C        TO BLUE WEAPON TYPES
         CALL NDIST(DSTBR,BWPN,BCHR,BWPMVR,BSPMDG,DBFBWP)
C
C      DETERMINE MOVEMENT RATES FOR EACH RED WEAPON TYPE
         CALL MVRT(ROVWTH,RDFAT,RWDRW,TRNTP,RCHR,RWPN,
```

```
     1        RMVRT,RWPMVR)
C
C      CALCULATE NEW DISTANCE FROM RED FORCE CENTROID
C        TO RED WEAPON TYPES
         CALL NDIST(DSTBR,RWPN,RCHR,RWPMVR,RSPMDG,DRFRWP)
C
C
C
C    CALCULATION OF FIRE AND MOVEMENT SUPPRESSION
C
C      CALCULATE BLUE ARTILLERY LOSSES FOR SUPPRESSION
         CALL ARTSP(KNTMNT,FPFTM,DBWRWP,BARTJF,ARPAM,BWPN,
     1      BCHR,BDFAT,BARTSP)
C
C      CALCULATE RED ARTILLERY LOSSES FOR SUPPRESSION
         CALL ARTSP(KNTMNT,FPFTM,DRWBWP,RARTJF,ARPAM,RWPN,
     1      RCHR,RDFAT,RARTSP)
C
C      CALCULATE BLUE FIRE AND MOVEMENT SUPPRESSION DEGRADATION
         CALL SPDG(BWDRW,RWDRW,BDFAT,BCHR,EBCLSS,ERCLSS,
     1      BARTSP,BMNLSS,BSPFDG,BSPMDG)
C
C      CALCULATE RED FIRE AND MOVEMENT SUPPRESSION DEGRADATION
         CALL SPDG(BWDRW,RWDRW,RDFAT,RCHR,ERCLSS,EBCLSS,
     1      RARTSP,RMNLSS,RSPFDG,RSPMDG)
C
C
C
C    CHECK FOR END OF MODULE RUN
C
       IF(BWDRW.EQ.2 .OR. RWDRW.EQ.2) THEN
         IF(KWDMNT.LT.NWDMNT .AND. KWDMNT.LT.10) THEN
           KWDMNT = KWDMNT + 1
           KNTMNT = KNTMNT + 1
           GO TO 10
         ELSE
           CALL REPRT(KNTMNT,RBKVLS,BRKVLS,BNUM,RNUM,BDEAD,
     1        RDEAD,BWPN,RWPN,BDSNG,RDSNG,BWDRW,RWDRW,BRDSUM,
     2        RRDSUM,DSTMIN)
           PRINT *, 'END OF DIAM RUN'
         END IF
C
       ELSE IF(KNTMNT.LT.1000) THEN
         KNTMNT = KNTMNT + 1
         GO TO 10
C
       END IF
       DEBUG SUBCHK
       AT 1
       END
WG 2608 DUMMY ARGUMENT 'AFRC' IS NEVER REFERENCED
WG 2607 VARIABLE 'PREP' APPEARS IN A DECLARATION BUT IS NEVER REFERENCED
WG 2608 DUMMY ARGUMENT 'SHOTSI' IS NEVER REFERENCED

N 3 WARNINGS 765 IBANK 10668 DBANK 30 COMMON
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```
  DIAMPUBLISH.ARTLSS
R1    04/01/82-10:33(0,1)
      C********************  SUBROUTINE ARTLSS  *********************
      C
      C
      C
                SUBROUTINE ARTLSS(KNTMNT,ARPAM,XARTJF,XWPN,XCHR,XARTLS)
      C
      C         THIS SUBROUTINE DETERMINES XARTLS(I,J), THE ARTILLERY LOSSES
      C           FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2
      C
      C         KNTMNT        MINUTE COUNTER FOR DIAM BATTLE
      C         ARPAM(7)      ESTIMATED BATTLE TIME FOR ARTILLERY
      C         XARTJF(I,3)   LOSS RATE PER MINUTE FOR X FORCE WEAPON TYPE I
      C                       IN TACTICAL MODE J=1,2
      C         XWPN(I,J+1)   NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
      C                       MODE J=1,2
      C         XCHR(I,4)     WEAPON CATEGORY OF X FORCE WEAPON TYPE I:
      C                       DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C
      C
                DIMENSION  XARTJF(10,4),XWPN(10,3),XCHR(10,5),XARTLS(10,2),
               1           ARPAM(8)
      C
      C
                IF(KNTMNT.LE.ARPAM(7)) THEN
      1           DO 10 I=1,10
                    DO 20 J=1,2
      C
                      IF(XWPN(I,J+1).GT.0) THEN
                        IF(XCHR(I,4).EQ.1 .AND. J.EQ.1) THEN
                          XARTLS(I,J) = 0
                        ELSE IF(XWPN(I,3).LT.0) THEN
                          XARTLS(I,J) = XARTJF(I,3)
                        ELSE
                          XARTLS(I,J) = XARTJF(I,3) * XWPN(I,J+1) /
               1              (XWPN(I,2) + XWPN(I,3))
                        END IF
                      ELSE
                        XARTLS(I,J) = 0
                      END IF
      20            CONTINUE
      10          CONTINUE
      C
                ELSE
                  DO 30 I=1,10
                    DO 40 J=1,2
                      XARTLS(I,J) = 0
      40            CONTINUE
      30          CONTINUE
      C
                END IF
                RETURN
                DEBUG SUBCHK
                AT 1
                END

N 253 IBANK 57 DBANK
```

DIAMPUBLISH.ARTSP
1 04/01/82-10:33(0,)

```
      C********************   SUBROUTINE ARTSP   **********************
      C
      C
      C
            SUBROUTINE ARTSP(KNTMNT,FPFTM,DXWYWP,XARTJF,ARPAM,XWPN,
           1                    XCHR,XDFAT,XARTSP)
      C
      C     THIS SUBROUTINE DETERMINES XARTSP(I,J), ARTILLERY LOSSES
      C       USED ONLY IN SUPPRESSION FOR X FORCE WEAPON TYPE I IN
      C       TACTICAL MODE J=1,2
      C
      C     KNTMNT           MINUTE COUNTER FOR DIAM BATTLE
      C     FPFTM            FINAL PROTECTIVE FIRE COUNTER FOR DIAM BATTLE
      C     DXWYWP(I,M,J)    DISTANCE FROM X FORCE WEAPON TYPE I IN TACTICAL
      C                      MODE J=1,2 TO Y FORCE WEAPON TYPE M OF WHICH ONLY
      C                      M=11,20 ARE IN TACTICAL MODE 2
      C     XARTJF(I,3)      X FORCE ARTILLERY LOSSES FOR WEAPON TYPE
      C                      I DURING MINUTE
      C                      TACTICAL MODE J=1,2
      C     ARPAM(4)         NUMBER OF MINUTES COUNTERPREP
      C     ARPAM(5)         NUMBER OF MINUTES FINAL PROTECTIVE FIRE
      C     ARPAM(8)         PREP MINUTES FIRED IN DIAM
      C     XDFAT            INDEX FOR X FORCE:  DEFENDING=1, ATTACKING=2
      C     XWPN(I,J+1)      NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
      C                      MODE J=1,2
      C
      C
            DIMENSION  DXWYWP(10,20,2),ARPAM(8),XARTJF(11,5),XARTSP(10,2)
           1,             XCHR(10,5),XWPN(10,3)
      C
      C
      1     VAR = 1
            IF(XDFAT.EQ.1) THEN
              PREPTM = ARPAM(8)
            ELSE IF(ARPAM(4).GT.0) THEN
              PREPTM = ARPAM(8) * 2/3
            ELSE
            END IF
      C
            IF(KNTMNT.LE.PREPTM) THEN
              VAR = 2
            END IF
      C
            DO 10 I=1,10
              DO 20 M=1,20
                DO 30 J=1,2
                  DIST = ABS(DXWYWP(I,M,J))
                  IF(DIST.LT.200) THEN
                    IF(FPFTM.LT. ARPAM(5)) THEN
                      VAR = 2
                      FPFTM = FPFTM + 1
                        GO TO 35
                    END IF
                  END IF
      30        CONTINUE
      20      CONTINUE
      10    CONTINUE
      C
      35    DO 40 I=1,10
```

```
                DO 50 J=1,2
                  IF(XWPN(I,J+1).GT.0) THEN
                    IF(XCHR(I,4).EQ.1 .AND. J.EQ.1) THEN
                      XARTSP(I,J) = 0
                    ELSE IF(XWPN(I,3).LT.0) THEN
                      XARTSP(I,J) = XARTJF(I,3)
                    ELSE
                      XARTSP(I,J) = XARTJF(I,3) * XWPN(I,J+1) /
     1                  (XWPN(I,2) + XWPN(I,3))
                    END IF
                  ELSE
                    XARTSP(I,J) = 0
                  END IF
C
                  XARTSP(I,J) = XARTSP(I,J) * VAR
C
   50           CONTINUE
   40         CONTINUE
C
              RETURN
              DEBUG SUBCHK
              AT 1
              END

N 353 IBANK 76 DBANK
```

```
DIAMPUBLISH.BSETLD
 1    04/01/82-10:33(0,)
      C********************** SUBROUTINE BSETLD ***********************
      C
      C
      C
            SUBROUTINE BSETLD(BNUM,IBU,BSLD,BSLDR,BCHR,IBNFID,BAMO)
      C
      C     THIS SUBROUTINE LOADS THE AMOUNT OF AMMUNITION AVAILABLE FOR
      C       A PARTICULAR WEAPON TYPE INTO BAMO
      C
      C     BAMO(I,J)    ARRAY FOR AMMUNITION LOAD FOR WEAPON TYPE I
      C                  OF WHICH J=1 IS THE PRINCIPAL WEAPON AND J=2
      C                  FOR SECONDARY ROUNDS
      C     BNUM         NUMBER OF BLUE FORCE WEAPON SYSTEMS
      C     IBU(I)       ARRAY POINTING TO PROPER ENTRY IN ARRAY IBNFID
      C                  FOR THE I WEAPONS CURRENTLY BEING PLAYED IN DIAM
      C     BSLD         FRACTION OF BASIC LOAD AVAILABLE FOR PRIMARY
      C                  SYSTEMS
      C     BSLDR        FRACTION OF BASIC LOAD AVAILABLE FOR SECONDARY
      C                  SYSTEMS
      C     BCHR(I,3)    BASIC LOAD FOR BLUE FORCE WEAPON TYPE I
      C     IBNFID(I,J)  ARRAY HOLDING PRINCIPAL JIFFY WEAPON DESCRIPTORS
      C                  FOR I=1,25 JIFFY WEAPONS PLAYED IN DIAM.  J=1,2 ARE
      C                  PRINCIPAL WEAPONS ON PLATFORM, AND J=3 CONTAINS A 6
      C                  WHEN THE WEAPON HAS A SECONDARY SYSTEM
      C
      C
            DIMENSION  BAMO(10,2),IBNFID(25,4),BCHR(10,5),IBU(10)
      C
      C
      C     SET LOAD FOR SECONDARY ROUNDS
      1       RRNDS = 300.0
      C     INITIALIZE ARRAYS AND VARIABLES
              VAR=0
              CALL INIT1(BAMO,VAR)
              IBNUM=BNUM
      C     LOAD PRIMARY AND SECONDARY ROUNDS
              DO 10 I=1,IBNUM
                BAMO(I,1) = BSLD * BCHR(I,3)
                IF(IBNFID(IBU(I),3).EQ.6) THEN
                  BAMO(I,2) = BSLDR * RRNDS
                END IF
                IF(IBNFID(IBU(I),1).EQ.21 .OR. IBNFID(IBU(I),1).EQ.26) THEN
                  BAMO(I,2) = BSLDR * 180
                END IF
      10      CONTINUE
      C
            RETURN
            DEBUG SUBCHK
            AT 1
            END

N 174 IBANK 54 DBANK
```

```
 DIAMPUBLISH.DMRTO
R1    04/01/82-13:33(0,1
      C*********************  SUBROUTINE DMRTO  *********************
      C
      C
      C
            SUBROUTINE DMRTO(XCHR,XWPN,XDMRTO)
      C
      C     THIS SUBROUTINE CALCULATES XDMRTO, THE RATIO OF X FORCE
      C       DISMOUNTED TROOPS TO X FORCE TROOP CARRIERS
      C
      C     XCHR(I,4)     CATEGORY OF X FORCE WEAPON TYPE I:
      C                   DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C     XWPN(I,3)     NUMBER OF WEAPON TYPE I IN TACTICAL MODE 2
      C     XTOTDM        TOTAL NUMBER OF X FORCE DISMOUNTED TROOPS
      C     XTOTMC        TOTAL NUMBER OF X FORCE MOUNTED CARRIERS
      C
      C
            DIMENSION  XCHR(10,5),XWPN(10,3)
      C
      C
      C     TOTAL NUMBER OF DISMOUNTED TROOPS
      1       XTOTDM=0
              DO 10 I=1,10
                IF(XCHR(I,4).EQ.1) THEN
                  IF(XWPN(I,3).GT.0) THEN
                    XTOTDM = XTOTDM + XWPN(I,3)
                  END IF
                END IF
      10      CONTINUE
      C
      C     TOTAL NUMBER OF TROOP CARRIERS
              XTOTMC=0
              DO 20 I=1,10
                IF(XCHR(I,4).EQ.3) THEN
                  IF(XWPN(I,3).GT.0) THEN
                    XTOTMC = XTOTMC + XWPN(I,3)
                  END IF
                END IF
      20      CONTINUE
      C
            IF(XTOTMC.EQ.0) THEN
              XTOTMC=-99999
              PRINT 1000
      1000    FORMAT(1H0,24H NO EMPTY TROOP CARRIERS)
            END IF
            IF(XTOTDM.EQ.0) THEN
              PRINT 1010
      1010    FORMAT(1H0,21H NO DISMOUNTED TROOPS)
            END IF
      C
            XDMRTO = XTOTDM/XTOTMC
      C
            RETURN
            DEBUG  SUBCHK
            AT 1
            END

N 126 IBANK 55 DBANK
```

```
DIAMPUBLISH.DSMLSS
31    04/01/82-10:33(0,1)
      C********************  SUBROUTINE DSMLSS  **********************
      C
      C
      C
            SUBROUTINE DSMLSS(XNUMDM,XWPN,XCHR,EXTLSS)
      C
      C     THIS SUBROUTINE DETERMINES THE NUMBER OF DISMOUNTED LOSSES
      C       WHILE BEING CARRIED IN TROOP CARRIERS
      C
      C     XNUMDM         NUMBER OF X FORCE TROOPS THAT DISMOUNT A
      C                    CARRIER
      C     XWPN(I,J+1)    NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
      C                    MODE J=1,2
      C     XCHR(I,4)      CATEGORY OF X FORCE WEAPON TYPE I:
      C                    DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C     EXTLSS(I,J)    EXPECTED TOTAL LOSSES OF X FORCE WEAPON
      C                    TYPE I IN TACTICAL MODE J=1,2
      C
            DIMENSION  XWPN(10,3),XCHR(10,5),EXTLSS(10,2)
      C
      C
      C     TOTAL ALL MOUNTED TROOPS
            TOTDM = 0
      1     DO 10 I=1,10
              IF(XCHR(I,4).EQ.1) THEN
                IF(XWPN(I,2).GT.0) THEN
                  TOTDM = XWPN(I,2) + TOTDM
                END IF
              END IF
      10    CONTINUE
      C
            IF(TOTDM.LE.0) THEN
              RETURN
            END IF
      C
      C     SEARCH FOR MOUNTED CARRIERS WITH LOSSES
              DO 20 I=1,10
                IF(XCHR(I,4).EQ.3) THEN
                  IF(XWPN(I,2).GT.0) THEN
                    IF (XWPN(I,3).GE.0) THEN
                      IF(EXTLSS(I,1).GT.0) THEN
      C
      C                 CALCULATE MOUNTED KILLS
                          TCLSS = EXTLSS(I,1)
                          DO 30 J=1,10
                            IF(XCHR(J,4).EQ.1) THEN
                              IF(XWPN(J,2).GT.0) THEN
                                EXTLSS(J,1) = XNUMDM*XWPN(J,2)*TCLSS/TOTDM
           1                      + EXTLSS(J,1)
                              END IF
                            END IF
      30                  CONTINUE
      C
                      END IF
                    END IF
                  END IF
                END IF
      20      CONTINUE
      C
```

```
670.        RETURN
680.        DEBUG SUBCHK
690.        AT 1
700.        END
```

N 209 IBANK 41 DBANK

```
 DIAMPUBLISH.DSNG
1   04/01/82-10:33(0,1
      C**********************  SUBROUTINE DSNG  **********************
      C
      C
      C
            SUBROUTINE DSNG(XHOLDS,XDSNG,XWPN,XCHR,XDEAD,IFRC,DGMATT,
           1                     XWDRW)
      C
      C     THIS SUBROUTINE DETERMINES IF THE X FORCE WILL WITHDRAW BASED
      C       ON CUMULATIVE WEAPON CATEGORY KILLS
      C
      C     XDSNG          INDEX FOR X FORCE:  ENGAGING=1, DISENGAGING=2
      C     XWPN(I,J+1)    NUMBER OF X FORCE WEAPON TYPES I IN TACTICAL
      C                    MODE J=1,2
      C     XCHR(I,4)      WEAPON CATEGORY OF X FORCE WEAPON TYPE I:
      C                    DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C     XDEAD(I,J)     CUMULATIVE DEAD FOR X FORCE WEAPON TYPE I IN
      C                    TACTICAL MODE J=1,2
      C     IFRC           INDEX FOR X FORCE:  BLUE=1, RED=2
      C     DGMATT(A,B)    DISENGAGEMENT ATTRITION FRACTIONS OF WEAPON
      C                    CATEGORY A AND FORCE B
      C     XWDRW          INDEX FOR X FORCE:  ENGAGING=1, WITHDRAWING=2
      C     CDEAD(A)       NUMBER OF WEAPONS DEAD IN WEAPON CATEGORY A
      C     CALIVE(A)      NUMBER OF WEAPONS ALIVE IN WEAPON CATEGORY A
      C     XHOLDS         INDEX FOR X FORCE:  HOLDING POSITION=1, ALLOWED
      C                    TO WITHDRAW=2
      C
      C
            DIMENSION  XWPN(10,3),XCHR(10,5),XDEAD(10,2),DGMATT(4,2)
           1,CDEAD(4),CALIVE(4)
      C
      C
            IF(XDSNG.EQ.2) THEN
              XWDRW=2
              RETURN
            END IF
      C
            IF(XHOLDS.EQ.1) THEN
              RETURN
            END IF
      C
      1     DO 10 I=1,4
              CDEAD(I) = 0
              CALIVE(I) = 0
      10    CONTINUE
      C
            DO 20 ICAT=1,4
              DO 30 J=1,2
                DO 40 I=1,10
                  IF(XCHR(I,4).EQ.ICAT) THEN
                    IF(XWPN(I,J+1).GT.0) THEN
                      CDEAD(ICAT) = CDEAD(ICAT) + XDEAD(I,J)
                      CALIVE(ICAT) = CALIVE(ICAT) + XWPN(I,J+1)
                    END IF
                  END IF
      40        CONTINUE
      30      CONTINUE
      20    CONTINUE
      C
            DO 50 ICAT=1,4
```

```
            IF((CDEAD(ICAT) + CALIVE(ICAT)).GT.0) THEN
              FRCT = CDEAD(ICAT) / (CDEAD(ICAT) + CALIVE(ICAT))
              IF(FRCT.GE.DGMATT(ICAT,IFRC)) THEN
                XWDRW = 2
              END IF
            END IF
   50     CONTINUE
   C
          RETURN
          DEBUG  SUBCHK
          AT 1
          END
```

N 229 IBANK 75 DBANK

DIAMPUBLISH.ECLOSS
.1   04/01/82-10:33(0,)

```
C ********************* SUBROUTINE ECLOSS *********************
C
C
C
      SUBROUTINE ECLOSS(YXPKW,XWPN,PCXVYZ,YRDFR,YFLSFR,
     1                  XSPFDG,EXCLSS)
C
C     THIS SUBROUTINE CALCULATES EXCLSS(I,M,J), THE EXPECTED
C       COMMITTEE LOSSES FOR X FORCE TARGET TYPES I IN TACTICAL
C       MODE J=1,2 FROM Y FORCE WEAPON M OF WHICH M=11,20 ARE IN
C       TACTICAL MODE 2
C
C     YXPKW(K,N,L)     SSPK FOR Y FORCE WEAPON K IN TACTICAL MODE
C                      L=1,2 AGAINST X FORCE TARGET N OF WHICH
C                      ARE IN TACTICAL MODE 2
C     XWPN(I,J+1)      NUMBER OF X FORCE WEAPON TYPE I IN
C                      TACTICAL MODE J=1,2
C      CXVYZ(I,M,J)    PERCENT VISIBLE OF X FORCE WEAPON TYPE I
C                      IN TACTICAL MODE J=1,2 TO Y FORCE
C                      WEAPON TYPE M OF WHICH M=11,20 ARE
C                      IN TACTICAL MODE 2
C     YRDFR(K,N,L)     ROUNDS FIRED BY Y FORCE WEAPON TYPE K
C                      IN TACTICAL MODE L=1,2 AGAINST X FORCE
C                      TARGET TYPE N OF WHICH N=11,20 ARE IN
C                      TACTICAL MODE 2
C     YFLSFR           FALSE FIRE FACTOR FOR Y FORCE:  INABILITY
C                      TO DISTINGUISH TARGETS
C     XSPFDG(I,J)      FIRE SUPPRESSION FOR X FORCE WEAPON
C                      TYPE I IN TACTICAL MODE J=1,2
C
      DIMENSION  YXPKW(10,20,2),XWPN(10,3),PCXVYZ(10,20,2)
     1,          YRDFR(10,20,2),EXCLSS(10,20,2),XSPFDG(10,2)
C
C
100   DO 10 J=1,2
        DO 20 I=1,10
          DO 30 L=1,2
            DO 40 K=1,10
C
              PCVIS = PCXVYZ(I,K+(L-1)*10,J) * (1 - XSPFDG(I,J)*0.33)
              PK = YXPKW(K,I+(J-1)*10,L)
              XNMTG = XWPN(I,J+1)
              RDFR = YRDFR(K,I+(J-1)*10,L) * YFLSFR
              CMMTT = XNMTG * PCVIS
              ACHMTT = AMAX1(1,CMMTT)
C
              EXCLSS(I,K+(L-1)*10,J) = CMMTT * (1-(1-PK/ACHMTT)**RDFR)
C
40          CONTINUE
30        CONTINUE
20      CONTINUE
10    CONTINUE
C
      RETURN
      DEBUG SUBCHK
      AT 100
      END
```

```
 DIAMPUBLISH.ETLOSS
?1    04/01/82-10:33(0,)
C********************  SUBROUTINE ETLOSS  *********************
C
C
C
            SUBROUTINE ETLOSS(XWPN,EXCLSS,EXTLSS)
C
C           THIS SUBROUTINE CALCULATES EXTLSS(I,J), THE TOTAL EXPECTED
C             DIRECT FIRE LOSSES OF X FORCE TARGET TYPE I IN TACTICAL
C             MODE J=1,2
C
C           XWPN(I,J+1)       NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
C                             MODE J=1,2
C           EXCLSS(I,M,J)     EXPECTED COMMITTEE LOSSES FOR X FORCE TARGET
C                             TYPE I IN TACTICAL MODE J=1,2 AGAINST Y FORCE
C                             WEAPON TYPE M OF WHICH M=11,20 ARE IN TACTICAL
C                             MODE 2
C
C
            DIMENSION  XWPN(10,3),EXCLSS(10,20,2),EXTLSS(10,2)
C
C
 100        DO 10 J=1,2
              DO 20 I=1,10
                SRV = 1
                DO 30 L=1,2
                  DO 40 K=1,10
C
                    AXWPN = AMAX1(1.,XWPN(I,J+1))
                    SRV = SRV * (1 - EXCLSS(I,K+(L-1)*10,J) / AXWPN)
C
 40               CONTINUE
 30             CONTINUE
                EXTLSS(I,J) = XWPN(I,J+1) * (1 - SRV)
 20           CONTINUE
 10         CONTINUE
C
            RETURN
            DEBUG SUBCHK
            AT 100
            END

N 137 IBANK 46 DBANK
```

```
  DIAMPUBLISH.INDX1
R1    04/01/82-10:33(0,)
      C********************  SUBROUTINE INDX1  *******************
      C
      C
      C
            SUBROUTINE INDX1(DFRC,BDFAT,RDFAT,BFRCTP,BDMMAX,RDMMAX,
           1                 BWDRW,RWDRW,BDMV,RDMV,BOVWTH,ROVWTH)
      C
      C     THIS SUBROUTINE PASSES THE FOLLOWING INDEXES FOR BLUE
      C       AND RED FORCES:
      C
      C     DFRC      1 = BLUE FORCE DEFENDS
      C               2 = RED FORCE DEFENDS
      C     BDFAT     1 = BLUE FORCE DEFENDS
      C               2 = BLUE FORCE ATTACKS
      C     RDFAT     1 = RED FORCE DEFENDS
      C               2 = RED FORCE ATTACKS
      C     BFRCTP    1 = LIGHT FORCE
      C               2 = HEAVY FORCE
      C     BDMMAX    MAXIMUM NUMBER OF BLUE TROOPS PER CARRIER
      C     RDMMAX    MAXIMUM NUMBER OF RED TROOPS PER CARRIER
      C     BWDRW     1 = BLUE FORCE ENGAGES
      C               2 = BLUE FORCE WITHDRAWS
      C     RWDRW     1 = RED FORCE ENGAGES
      C               2 = RED FORCE WITHDRAWS
      C     BDMV      1 = BLUE FORCE IS MOUNTED
      C               2 = BLUE FORCE IS DISMOUNTED
      C     RDMV      1 = RED FORCE IS MOUNTED
      C               2 = RED FORCE IS DISMOUNTED
      C     BOVWTH    1 = BLUE FORCE IS NOT IN OVERWATCH
      C               2 = BLUE FORCE IS IN OVERWATCH
      C     ROVWTH    1 = RED FORCE IS NOT IN OVERWATCH
      C               2 = RED FORCE IS IN OVERWATCH
      C
      C
      C     DETERMINE IF RED OR BLUE FORCES ARE ATTACKING OR DEFENDING
              IF(DFRC.EQ.1) THEN
      1         BDFAT=1
                RDFAT=2
              ELSE
                BDFAT=2
                RDFAT=1
              END IF
      C
      C     DETERMINE MAXIMUM NUMBER OF TROOPS PER RED AND BLUE CARRIERS
              IF(BFRCTP.EQ.1) THEN
                BDMMAX=9
              ELSE
                BDMMAX=7
              END IF
              RDMMAX=8
      C
      C     SET WITHDRAWAL INDEXES
              BWDRW=1
              RWDRW=1
      C
      C     SET DISMOUNT INDEXES
              BDMV=2
              RDMV=2
      C
```

```
C      SET OVERWATCH INDEXE
         BOVWTH=1
         ROVWTH=1
C
       RETURN
       DEBUG  SUBCHK
       AT 1
       END
```

N 57 IBANK 27 DBANK

DIAMPUBLISH.INDX2
1   04/01/82-10:33(0,)

```
C********************  SUBROUTINE INDX2  *********************
C
C
C
      SUBROUTINE INDX2(KNTMNT,KWDMNT,FPFTM,BDSNG,RDSNG,AMFLD,
     1                 BDFAT,BFLSFR,RFLSFR,BHOLDS,RHOLDS)
C
C     THIS SUBROUTINE INITIALIZES THE FOLLOWING VARIABLES AND
C       INDEXES
C
C     KNTMNT      MINUTE COUNTER FOR DIAM BATTLE
C     KWDMNT      MINUTE COUNTER DURING WITHDRAWAL IN DIAM
C     FPFTM       MINUTE COUNTER FOR FINAL PROTECTIVE FIRES
C     BDSNG       INDEX FOR X FORCE:  1=ENGAGING, 2=DISENGAGING
C     RDSNG       INDEX FOR Y FORCE:  1=ENGAGING, 2=DISENGAGING
C     AMFLD(1)    INDEX FOR MINES IN USE: 0=NO, 1=YES
C     AMFLD(2)    MINEFIELD WIDTH
C     AMFLD(3)    MINEFIELD FRACTION NOT BYPASSED
C     AMFLD(4)    FRACTION OF ATTACKING FORCE ENTERING MINEFIELD
C     BFLSFR      FALSE FIRING FACTOR FOR BLUE FORCE
C     RFLSFR      FALSE FIRING FACTOR FOR RED FORCE
C     BDFAT       INDEX FOR BLUE FORCE:  1=DEFENDING, 2=ATTACKING
C     BHOLDS      INDEX FOR BLUE FORCE:  1=BLUE FORCE HOLDS POSITION,
C                 2=BLUE IS ALLOWED TO WITHDRAW
C     RHOLDS      INDEX FOR RED FORCE:  1=RED FORCE HOLDS POSITION,
C                 2=RED IS ALLOWED TO WITHDRAW
C
C
      DIMENSION AMFLD(4)
C
C
C     INITIALIZE VARIABLES:
        KNTMNT=1
        KWDMNT=0
        FPFTM=0
        BDSNG=1
        RDSNG=1
        BHOLDS=2
        RHOLDS=2
C
        DO 10 I=1,4
          AMFLD(I) = 0
 10     CONTINUE
C
      IF(BDFAT.EQ.1)THEN
        BFLSFR = 0.8
        RFLSFR = 0.4
      ELSE
        BFLSFR = 0.4
        RFLSFR = 0.8
      END IF
C
      RETURN
        END
```

N 54 IBANK 22 DBANK

DIAMPUBLISH.INIT1

1   04/01/82-10:33(0,)

```
C*********************** SUBROUTINE INIT1 ***********************
C
C
      SUBROUTINE INIT1(ARRAY,VAR)
C
C     THIS SUBROUTINE INITIALIZES ARRAY(I,J) TO EQUAL VAR
C
C
      DIMENSION ARRAY(10,2)
C
C
      DO 10 J=1,2
        DO 20 I=1,10
C
          ARRAY(I,J)=VAR
C
   20   CONTINUE
   10 CONTINUE
C
      RETURN
      END
```

40 IBANK 15 DBANK

```
  DIAMPUBLISH.INTART
RI   04/01/82-10:33(0,1
      C********************  SUBROUTINE INTART  ********************
      C
      C
      C
            SUBROUTINE INTART(ARPAM,BARTJF,RARTJF)
      C
      C     THIS SUBROUTINE DETERMINES ARTILLERY LOSS RATES TO USE IN DIAM
      C
      C     ARPAM(7)      ESTIMATED BATTLE TIME FOR ARTILLERY
      C     BARTJF(I,4)   NUMBER OF BLUE FORCE WEAPON TYPE I LOSSES DUE TO
      C                   ARTILLERY
      C     BARTJF(I,3)   NUMBER OF BLUE FORCE WEAPON TYPE I LOSSES PER
      C                   MINUTE DUE TO ARTILLERY
      C     RARTJF(I,4)   NUMBER OF RED FORCE WEAPON TYPE I LOSSES DUE TO
      C                   ARTILLERY
      C     RARTJF(I,3)   NUMBER OF RED FORCE WEAPON TYPE I LOSSES PER
      C                   MINUTE DUE TO ARTILLERY
      C
      C
            DIMENSION  BARTJF(10,4),RARTJF(10,4),ARPAM(8)
      C
      C
      1     DO 10 I=1,10
              BARTJF(I,3) = BARTJF(I,4) / ARPAM(7)
              RARTJF(I,3) = RARTJF(I,4) / ARPAM(7)
      10    CONTINUE
      C
            RETURN
            DEBUG SUBCHK
            AT 1
            END

N 55 IBANK 31 DBANK
```

DIAMPUBLISH.INTDST
R1   04/01/82-10:33(0,)

```
C*************************** SUBROUTINE INTDST *********************
C
C
C
      SUBROUTINE INTDST(IFRC,XCHR,XWPN,DFCWC,DXFXWP)
C
C     THIS SUBROUTINE INITIALIZES DXFXWP(I,J), THE DISTANCE
C       FROM X FORCE CENTROID TO X FORCE WEAPON TYPE I IN
C       TACTICAL MODE J=1,2
C
C     IFRC               INDEX:  1=BLUE FORCE, 2=RED FORCE
C     XCHR(I,4)          WEAPON CATEGORY FOR X FORCE WEAPON TYPE I:
C                        DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C     XWPN(I,J+1)        NUMBER OF X FORCE WEAPON TYPE I IN
C                        TACTICAL MODE J=1,2
C     DFCWC(B,IFRC)      DISTANCE FROM IFRC CENTROID TO
C                        WEAPON CATEGORY CENTROID B
C
C
      DIMENSION  XCHR(10,5),XWPN(10,3),DFCWC(4,2),DXFXWP(10,2)
C
C
1     DO 10 J=1,2
        DO 20 I=1,10
C
          IF(XWPN(I,J+1).GT.0) THEN
            IF((XCHR(I,4).EQ.1).AND.(J.EQ.1)) THEN
              DXFXWP(I,J) = -9999999
            ELSE
              DXFXWP(I,J) = DFCWC(XCHR(I,4),IFRC)
            END IF
          ELSE
            DXFXWP(I,J) = -9999999
          END IF
C
20      CONTINUE
10    CONTINUE
C
      RETURN
      DEBUG  SUBCHK
      AT 1
      END
```

N 153 IBANK 47 DBANK

```
DIAMPUBLISH.JFLSS
R1    04/01/82-10:33(0,1)
      C*********************  SUBROUTINE JFLSS  *********************
      C
      C
      C
            SUBROUTINE JFLSS(YCHR,YWPN,EYCLSS,EYTLSS,YARTLS,YMNLSS,XYKVLS)
      C
      C     THIS SUBROUTINE CALCULATES XYKVLS(M,I), THE KILLER VICTIM
      C       SCOREBOARD FOR X FORCE KILLER WEAPON TYPE M AGAINST Y
      C       FORCE VICTIM WEAPON TYPE I.  THE LOSSES ARE UPDATED AND
      C       CUMULATED EVERY MINUTE.
      C
      C     EYCLSS(I,M,J)  THE EXPECTED COMMITTEE LOSSES FOR Y FORCE
      C                    TARGET TYPE I IN TACTICAL MODE J FROM THE
      C                    OPPOSING FORCE WEAPON TYPE M OF WHICH
      C                    J=11,2. ARE TACTICAL MODE 2
      C     EYTLSS(I,J)    THE TOTAL EXPECTED LOSSES FOR Y FORCE
      C                    WEAPON TYPE I IN TACTICAL MODE J=1,2
      C     AKILL(M)       LOCAL ARRAY HOLDING NUMBER OF WEAPONS
      C                    KILLED BY WEAPON TYPE M
      C     CLOSS          TOTAL NUMBER OF VICTIMS BY COMMITTEE LOSSES
      C                    KILLED BY  WEAPON TYPE M
      C     YARTLS(I,J)    ARTILLERY LOSSES FOR Y FORCE WEAPON TYPE
      C                    I IN TACTICAL MODE J=1,2
      C     YMNLSS(I,J)    MINE LOSSES FOR Y FORCE WEAPON TYPE I IN
      C                    TACTICAL MODE J=1,2
      C
      C
            DIMENSION  EYCLSS(10,20,2),EYTLSS(10,2),XYKVLS(12,13)
           1,          AKILL(10),YARTLS(10,2),YMNLSS(10,2),YWPN(10,3)
           2,          EKILL(10,10),EZTLSS(10,2),YCHR(10,5)
      C
      C
      C     COPY EXPECTED LOSSES DURING MINUTE
      1       DO 10 J=1,2
                DO 20 I=1,10
                  EZTLSS(I,J) = EYTLSS(I,J)
      20        CONTINUE
      10      CONTINUE
      C
      C     EXCLUDE MOUNTED INFANTRY LOSSES
              DO 30 I=1,10
                IF(YCHR(I,4).EQ.1 .AND. EYTLSS(I,1).GT.0) THEN
                  EZTLSS(I,1) = 0
                END IF
      30      CONTINUE
      C
      C     CALCULATE ARTILLERY AND MINE LOSSES AGAINST VICTIMS
              DO 40 I=1,10
                XYKVLS(11,I) = YARTLS(I,1) + YARTLS(I,2) + XYKVLS(11,I)
                XYKVLS(12,I) = YMNLSS(I,1) + YMNLSS(I,2) + XYKVLS(12,I)
      40      CONTINUE
      C
      C     CALCULATE KILLER/VICTIM SCOREBOARD EXCLUDING MOUNTED INFANTRY
              DO 70 I=1,10
                CLOSS = 0
                DO 50 M=1,10
                  AKILL(M) = EYCLSS(I,M,1) + EYCLSS(I,M,2)
                  AKILL(M) = AKILL(M) + EYCLSS(I,M+10,1) + EYCLSS(I,M+10,2)
                  CLOSS = CLOSS + AKILL(M)
```

```
50        CONTINUE
C         COMPUTE FRACTION OF VICTIM I KILLED BY WEAPON M
            DO 60 M=1,10
              IF(CLOSS.GT.0) THEN
                BKILL(M,I) = AKILL(M)*(EZTLSS(I,1)+EZTLSS(I,2))/CLOSS
                XYKVLS(M,I) = XYKVLS(M,I) + BKILL(M,I)
              END IF
60          CONTINUE
70      CONTINUE
C
C     TOTAL KILLER/VICTIM TROOP CARRIER LOSSES
        TOTCKL = 0
        DO 80 M=1,10
          DO 90 I=1,10
            IF(YCHR(I,4).EQ.3 .AND. YWPN(I,3).NE.-999) THEN
              TOTCKL = TOTCKL + BKILL(M,I)
            END IF
90        CONTINUE
80      CONTINUE
C
C     CALCULATE KILLER/VICTIM SCOREBOARD FOR MOUNTED INFANTRY
        DO 100 M=1,10
          DO 110 I=1,10
            IF(YCHR(I,4).EQ.3 .AND. YWPN(I,3).NE.-999) THEN
              CARR = BKILL(M,I)
              DO 120 J=1,10
                IF(YCHR(J,4).EQ.1 .AND. EYTLSS(J,1).GT.0) THEN
                  IF(TOTCKL.GT.0) THEN
                    XYKVLS(M,J) = XYKVLS(M,J) + (CARR/TOTCKL)
     1                * EYTLSS(J,1)
                  END IF
                END IF
120           CONTINUE
            END IF
110       CONTINUE
100     CONTINUE
C
C
      RETURN
      DEBUG SUBCHK
      AT 1
      END
```

N 557 IBANK 227 DBANK

```
 DIAMPUBLISH.LRDT
1   04/01/82-10:33(0,1)
C************ ********* S BROUTINE LRDT **********************
C
C
C
      SUBROUTINE LRDT(BFRCTP,RFRCTP,DPSTR,TACA)
C
C     THIS SUBROUTINE INITIALIZES THE FOLLOWING VARIABLES
C       AND THE TACTICS ARRAY.  TACTICS PERTAIN TO ATTACKER
C       LIGHT AND HEAVY CATEGORY WEAPONS ONLY.  LIGHT
C       SYSTEMS WHICH ARE TROOP CARRIERS CAN DISMOUNT
C       INFANTRY, AND HEAVY SYSTEMS CAN GO INTO OVERWATCH.
C
C     BFRCTP   INDEX FOR BLUE FORCE:  LIGHT=1, HEAVY=2
C     RFRCTP   INDEX FOR RED FORCE:  LIGHT=1, HEAVY=2
C     DPSTR    INDEX FOR DEFENSE POSTURE:  PREPARED=1,
C              HASTY=2, AMBUSHED=3
C              BLUE FORCE CENTROID (MAX IS 1000 METERS)
C
C     THE FOLLOWING EXPLAIN THE SUBSCRIPTS FOR TACA(I,J)
C       I=1    ATTACKING LIGHT CATEGORY WEAPON
C       I=2    ATTACKING HEAVY CATEGORY WEAPON
C       J=1    POINTER TO DEFENDER WEAPON CATEGORY WHO INITIATES
C              TACTICAL MODE CHANGE FOR I
C       J=2    DISTANCE FROM DEFENDER TO ATTACKER AT WHICH
C              TACTICAL MODE CHANGE OCCURS.
C       J=3    PERCENTAGE OF I=2 TYPE WEAPONS THAT GOES INTO
C              TACTICAL MODE CHANGE. FOR I=1 TYPE WEAPONS ALL
C              TROOP CARRIERS WILL DISMOUNT TROOPS
C
C
      DIMENSION  TACA(2,3)
C
C
1     BFRCTP = 1
      RFRCTP = 1
       PSTR = 1
C
      DO 10 I=1,2
        TACA(I,1) = 1
        TACA(I,2) =300
        TACA(I,3) = 0.33
10    CONTINUE
C
      RETURN
      DEBUG SUBCHK
      AT 1
      END

N 63 IBANK 21 DBANK
```

DIAMPUBLISH.MINCHR
R1 04/01/82-10:33(0,1)

```
C*********************** SUBROUTINE MINCHR **********************
C
C
C
          SUBROUTINE MINCHR(AMFLD,FMNFLD,BMNFLD,DFCWC,DFRC,AMLSR)
C         THIS SUBROUTINE REQUESTS MINEFIELD INFORMATION FOR THE
C           DEFENDING FORCE FROM THE GAMER
C
C         AMFLD(1)     INDEX FOR PLAYING MINEFIELDS:  NO=0, YES=1
C         AMFLD(2)     MINEFIELD WIDTH
C         AMFLD(3)     MINEFIELD FRACTION NOT BYPASSED
C         AMFLD(4)     FRACTION OF ATTACKING FORCE ENTERING MINEFIELD
C         FMNFLD       LOCATION OF FRONT EDGE OF MINEFIELD
C         BMNFLD       LOCATION OF BACK EDGE OF MINEFIELD
C         AMLSR(I)     MINEFIELD LOSS RATES FOR ATTACKING WEAPON
C                      CATEGORY TYPE I=1,4:
C                      DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C         DFCWC(I,J)   DISTANCE FROM FORCE CENTROID J=1,2 TO WEAPON
C                      CATEGORY I=1,4:  BLUE=1, RED=2,
C                      DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C         DFRC         INDEX FOR DEFENDING FORCE:  BLUE=1, RED=2
C
C
          COMMON/REED/JDAY1,XINX(4),ICARD(20),IHY,IHN,IHD,IHYES,IHNO
C
          DIMENSION  AMFLD(4),DFCWC(4,2),AMLSR(4)
C
C
C
C         INITIALIZE MINEFIELD LOSS RATES
    1       AMLSR(1) = 0.10
            AMLSR(2) = 0.14
            AMLSR(3) = 0.14
            AMLSR(4) = 0.14
C
   10     PRINT 1000
 1000     FORMAT(1X,'IS THE DEFENDER USING MINES IN THE 200-400 METER',
         1' RANGE BAND? ')
          CALL REEDA(IANS)
          IF(IANS.EQ.IHY) THEN
            AMFLD(1) = 1.0
            ELSE IF(IANS.NE.IHY .AND. IANS.NE.IHN) THEN
            GO TO 10
          ELSE
            RETURN
          END IF
C
   20     PRINT 1010
 1010     FORMAT(1X,'ENTER WIDTH OF MINEFIELD IN METERS')
          CALL REED4
          AMFLD(2) = XINX(1)
          IF(AMFLD(2).LT.0 .OR. AMFLD(2).GT.9999) THEN
            GO TO 20
          END IF
C
   30     PRINT 1020
 1020     FORMAT(1X,'ENTER FRACTION OF MINEFIELD NOT BYPASSED BY',
         1' ATTACKER ')
          CALL REED4
```

```
          AMFLD(3) = XINX(1)
          IF(AMFLD(3).LT.0 .OR. AMFLD(3).GT.1.0) THEN
            GO TO 30
          END IF
    C
    40    PRINT 1030
    1030  FORMAT(1X,'WHAT FRACTION OF THE ATTACKING FORCE ENTERS '
         1'THE MINEFIELD?')
          CALL FEED4
          AMFLD(4) = XINX(1)
          IF(AMFLD(4).LT.0 .OR. AMFLD(4).GT.1.0) THEN
            GO TO 40
          END IF
    C
          PRINT 1040
    1040  FORMAT(1X,'DO YOU WISH TO CHANGE INPUTS?')
          CALL READA(IANS)
          IF(IANS.EQ.1HY) THEN
            GO TO 10
          END IF
    C
    C     FIX FRONT AND REAR EDGES OF THE MINEFIELD
            FMNFLD = 400 + DFCWC(1,DFRC)
            BMNFLD = 200 + DFCWC(1,DFRC)
    C
          RETURN
          DEBUG SUBCHK
          AT 1
          END
```

N 27" IBANK 143 DBANK 36 COMMON

DIAMPUBLISH.MNLSS
R1 04/01/82-10:33(0,)

```
C**********************  SUBROUTINE MNLSS  **********************
C
C
C
      SUBROUTINE MNLSS(AMFLD,AMLSR,AWDTH,DSTBR,FMNFLD,BMNFLD,
     1                 XCHR,XWPN,DXFXWP,XMNLSS)
C
C     THIS SUBROUTINE COMPUTES ATTACKER LOSSES FROM DEFENDER
C       MINEFIELDS
C
C     AWDTH(I,J)   CORRIDOR WIDTH FOR ATTACKER FOR WEAPON CATEGORY
C                  I=1,4 AND IN RANGE BAND J=1,5:
C                  DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4;
C                  0-200=1, 200-400=2, 400-600=3, 600-800=4,
C                  800-1000=5
C     AMFLD(1)     INDEX FOR DEFENDER PLAYING MINES:  NO=1, YES=2
C     AMFLD(2)     MINEFIELD WIDTH
C     AMFLD(3)     MINEFIELD FRACTION NOT BYPASSED
C     AMFLD(4)     FRACTION OF ATTACKING FORCE ENTERING MINEFIELD
C     XMNLSS(I,J)  MINE LOSSES TO WEAPON TYPE I IN TACTICAL MODE
C                  J=1,2
C     DXWFM        ATTACKER POSITION RELATIVE TO THE FRONT EDGE OF
C                  THE MINEFIELD
C     DXWBM        ATTACKER POSITION RELATIVE TO THE REAR EDGE OF
C                  THE MINEFIELD
C     PVC          PERCENT TERRAIN COVERAGE OF THE MINEFIELD
C     DSTBR        DISTANCE BETWEEN RED AND BLUE FORCE CENTROIDS
C     DXFXWP(I,J)  DISTANCE FROM X FORCE CENTROID TO X FORCE
C                  WEAPON TYPE I IN TACTICAL MODE J=1,2
C     XCHR(1,4)    WEAPON CATEGORY FOR X FORCE WEAPON TYPE I:
C                  DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C     FMNFLD       LOCATION OF FRONT EDGE OF MINEFIELD
C     BMNFLD       LOCATION OF BACK EDGE OF MINEFIELD
C
C
      DIMENSION  AMFLD(4),AMLSR(4),AWDTH(4,5),XMNLSS(10,2),
     1           DXFXWP(10,2),XCHR(10,5),XWPN(10,3)
C
C
C     CHECK FOR MINEFIELD PARAMETERS
      IF(AMFLD(1).EQ.0 .OR. AMFLD(4).EQ.0) THEN
        RETURN
      END IF
C
C     ZERO-OUT PAST MINEFIELD LOSSES
      VAR=0
      CALL INITI(XMNLSS,VAR)
C
C     CHECK FOR ENTRANCE INTO MINEFIELD
      DO 30 I=1,10
        DO 40 J=1,2
          IF(XWPN(I,J+1).GT.0) THEN
            DXWFM = DSTBR - DXFXWP(I,J) - FMNFLD
            DXWBM = DSTBR - DXFXWP(I,J) - BMNFLD
            IF(DXWFM.LE.0 .AND. DXWBM.GE.0) THEN
C
C             CALCULATE MINE LOSSES
              IF(AWDTH(XCHR(I,4),1).GT.0) THEN
                PCV = AMFLD(2) * AMFLD(3) / AWDTH(XCHR(I,4),1)
```

```
                              XMNLSS(I,J) = XWPN(I,J+1) * PCV * AMFLD(4)
         1                      * AMLSR(XCHR(I,4))
                         END IF
                      END IF
                   END IF
   40           CONTINUE
   30        CONTINUE
   C
             RETURN
             DEBUG SUBCHK
             AT 1
             END
```

273 IBANK 78 DBANK

DIAMPUBLISH.MOVIN
R1 04/01/82-10:33(0,1)

```
      C*********************  SUBROUTINE MOVIN  *********************
      C
      C
      C
            SUBROUTINE MOVIN(IOBS,IOPN,KK27,KK20,BMVRT,RMVRT,BDTCT,RDTCT)
      C
      C     THIS SUBROUTINE LOADS BLUE MOVEMENT RATES AND DETECTION
      C       DATA AND RED MOVEMENT RATES AND DETECTION DATA FROM
      C       RANDOM ACCESS FILES 27 AND 20
      C
      C     IOBS            POINTS TO THE DAY TYPE:  1=CLEAR, 2=NIGHT,
      C                     3=OBSCURED
      C     IOPN            POINTS TO TERRAIN TYPE 1=OPEN, 2=CLOSED
      C     KK27            POINTER FROM MOVEMENT RATE FILE
      C     KK20            POINTER FROM DETECTION FILE
      C     BMVRT(A,B)      MOVEMENT RATE FOR BLUE FORCE BASED ON
      C                     WEAPON CATEGORY A (1=DISMOUNTED,
      C                     2=MORTARS, 3=LIGHT, 4=HEAVY) AND
      C                     TERRAIN TYPE B (1=OPEN, 2=CLOSED)
      C     RMVRT(A,B)      MOVEMENT RATE FOR RED FORCE BASED ON
      C                     WEAPON CATEGORY A (SEE ABOVE)
      C     BDTCT(I,J,K)    BLUE WEAPON DETECT TIMES AGAINST RED
      C                     TARGETS BASED ON TARGET EXPOSURE I
      C                     (1=VEHICLE EXPOSED, 2=VEHICLE DEFILADE,
      C                     (3=SOLDIER EXPOSED, 4=SOLDIER DEFILADE),
      C                     BLUE WEAPON SENSOR B (1=EYE, 2=OPTICAL
      C                     SIGHT, 3=THERMAL SIGHT, 4=IMAGE INTEN-
      C                     SIFIER), AND RANGE BAND K (0=1-200,
      C                     2=200-400, 3=400-600, 4=600-800,
      C                     5=800-1000)
      C     RDTCT(I,J,K)    RED WEAPON DETECT TIMES AGAINST BLUE
      C                     TARGETS BASED ON TARGET EXPOSURE I,
      C                     RED WEAPON SENSOR B, AND RANGE BAND K
      C                     (SEE ABOVE)
      C
      C
            DIMENSION BMVRT(4,2),RMVRT(4,2),BDTCT(4,4,5),RDTCT(4,4,5)
      C
      C
      C
      C     SELECT POINTER TO PROPER MOVEMENT RATE
              DEFINE FILE 27(6,8,U,K27),20(30,16,U,K20)
              K27=(IOPN-1)*2+1
              READ (27'K27)((BMVRT (I,J),I=1,4),J=1,2)
              READ (27'K27)((RMVRT (I,J),I=1,4),J=1,2)
      C
      C     SELECT POINTER TO PROPER DETECTION FILE
              K20=(IOBS-1)*10+1
              DO 10 K=1,5
                READ (20'K20)((BDTCT(I,J,K),I=1,4),J=1,4)
         10   CONTINUE
      C
              DO 20 K=1,5
                READ (20'K20)((RDTCT(I,J,K),I=1,4),J=1,4)
         20   CONTINUE
      C
            CLOSE(20)
            CLOSE(27)
            KK27=K27
```

```
690.        KK20=K20
700.        RETURN
710.        DEBUG SUBCHK
720.        AT 1
730.        END
```

N 99 IBANK 219 DBANK

DIAMPUBLISH.MVRT
R1 04/01/82-10:33(0,)

```
C**********************  SUBROUTINE MVRT  **********************
C
C
C
      SUBROUTINE MVRT(XOVWTH,XDFAT,XWDRW,TRNTP,XCHR,XWPN,
     1                XMVRT,XWPMVR)
C
C     THIS SUBROUTINE DETERMINES XWPMVR(I,J), THE MOVEMENT RATES
C       FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2
C
C     XOVWTH        INDEX FOR X FORCE:  1=NOT IN OVERWATCH,
C                   2=IN OVERWATCH
C     XDFAT         INDEX FOR X FORCE:  1=DEFENSE, 2=OFFENSE
C     XWDRW         INDEX FOR X FORCE:  1=ENGAGE, 2=WITHDRAW
C     XCHR(I,4)     CATEGORY FOR X FORCE WEAPON TYPE I:
C                   1=DISMOUNTED, 2=MORTARS, 3=LIGHT, 4=HEAVY
C     XWPN(I,J+1)   NUMBER OF X FORCE WEAPONS IN TACTICAL
C                   MODE J=1,2
C     XMVRT(A,B)    MOVEMENT RATE FOR X FORCE BASED ON:
C                   A=WEAPON CATEGORY, B=TERRAIN TYPE
C     TRNTP         INDEX FOR TERRAIN TYPE:  1=OPEN, 2=CLOSE
C
C
      DIMENSION  XCHR(10,5),XWPN(10,3),XMVRT(4,2),XWPMVR(10,2)
C
C
1     IF(XWDRW.EQ.2) THEN
        VAR = -1
      ELSE IF(XDFAT.EQ.1) THEN
        VAR = 0
      ELSE
        VAR = 1
      END IF
C
      DO 10 J=1,2
        DO 20 I=1,10
          IF(XWPN(I,J+1).GT.0) THEN
            XWPMVR(I,J) = XMVRT(XCHR(I,4),TRNTP) * VAR
          ELSE
            XWPMVR(I,J) = 0
          END IF
20      CONTINUE
10    CONTINUE
C
      DO 30 I=1,10
        IF(XCHR(I,4).EQ.4) THEN
          IF(XWPN(I,3).GT.0) THEN
            IF(XOVWTH.EQ.2) THEN
              XWPMVR(I,2) = 0
            END IF
          END IF
        ELSE IF(XCHR(I,4).EQ.1) THEN
          IF(XWPN(I,2).GT.0) THEN
            XWPMVR(I,1) = 0
          END IF
        ELSE
        END IF
30    CONTINUE
C
```

SIFIED

```
690.    C
700.            RETURN
71'.            DEBUG  SUBCHK
72'.            AT 1
73'.            END
```

'N 223 IBANK 55 DBANK

DIAMPUBLISH.NDIST
R1 04/01/82-10:33(0,1)

```
      C**********************  SUBROUTINE NDIST  *********************
      C
      C
      C
            SUBROUTINE NDIST(DSTBR,XWPN,XCHR,XWPMVR,XSPMDG,DXFXWP)
      C
      C     THIS SUBROUTINE RECALCULATES DXFXWP(I,J), THE DISTANCE
      C       FROM THE X FORCE CENTROID TO X FORCE WEAPON TYPE I IN
      C       TACTICAL MODE J=1,2
      C
      C     DSTBR          DISTANCE BETWEEN RED AND BLUE CENTROIDS
      C     XWPN(I,J+1)    NUMBER OF X FORCE TYPE WEAPON TYPE I IN
      C                    TACTICAL MODE J=1,2
      C     XWPMVR(I,J)    MOVEMENT RATE FOR X FORCE WEAPON TYPE I IN
      C                    TACTICAL MODE J=1,2
      C     XSPMDG(I,J)    MOVEMENT SUPPRESSION DEGRADATION FOR X
      C                    FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2
      C     XCHR(I,4)      X FORCE WEAPON TYPE I CATEGORIES:
      C                    DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C
      C
            DIMENSION  XWPN(10,3),XWPMVR(10,2),XSPMDG(10,2),
           1           DXFXWP(10,2),XCHR(10,5)
      C
      C
      C     CALCULATE MINIMUM (SUPPRESSION X MOVEMENT RATE)
      1       ZMIN = 1000
              DO 10 J=1,2
                DO 20 I=1,10
                  IF(XWPN(I,J+1).GT.0) THEN
                    IF(XCHR(I,4).NE.1 .OR. J.NE.1) THEN
                      IF(XWPMVR(I,J).NE.0) THEN
                        ZMIN = AMIN1(ZMIN,XWPMVR(I,J)*(1-XSPMDG(I,J)))
                      END IF
                    END IF
                  END IF
      20        CONTINUE
      10      CONTINUE
      C
            IF(ZMIN.EQ.1000) THEN
              RETURN
            END IF
      C
      C     CALCULATE NEW DISTANCES
              DO 30 J=1,2
                DO 40 I=1,10
                  IF(XWPN(I,J+1).GT.0) THEN
                    IF(XCHR(I,4).NE.1 .OR. J.NE.1) THEN
                      IF(XWPMVR(I,J).NE.0) THEN
                        DXFXWP(I,J) = DXFXWP(I,J) + ZMIN
                      END IF
                    ELSE
                      DXFXWP(I,J) = -9999999
                    END IF
                  ELSE
                    DXFXWP(I,J) = -9999999
                  END IF
      40        CONTINUE
      30      CONTINUE
```

```
C
C      CHECK FOR OVERRUNNING OPPONENTS
         DO 50 J=1,2
           DO 60 I=1,10
             IF(DXFXWP(I,J).GE.DSTBR) THEN
               DXFXWP(I,J) = DSTBR -10.0
             END IF
60         CONTINUE
50       CONTINUE
C
       RETURN
       DEBUG SUBCHK
       AT 1
       END
```

N 295 IBANK 61 DBANK

```
DIAMPUBLISH.NUMTGT
R1    04/01/82-10:33(0,)
      C************************ SUBROUTINE NUMTGT ******************
      C
      C
      C
            SUBROUTINE NUMTGT(XYPKW,YWPN,PCYVXZ,YSPFDG,TOTYTG)
      C
      C     THIS SUBROUTINE CALCULATES TOTYTG(I,J), TOTAL Y TARGETS
      C       FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2
      C
      C     YWPN(K,L+1)       CONTAINS NUMBER OF Y FORCE WEAPON TYPE K
      C                       IN TACTICAL MODE L=1,2
      C     PCYVXZ(K,N,L)     PERCENT OF Y FORCE WEAPON TYPE K IN TACTICAL
      C                       MODE L=1,2 VISIBLE TO X FORCE WEAPON TYPE N
      C                       OF WHICH N=11,20 ARE IN TACTICAL MODE 2
      C     XYPKW(I,M,J)      SINGLE SHOT PROBABILITY OF KILL(SSPK)
      C                       OF X FORCE WEAPON TYPE I IN TACTICAL
      C                       MODE J=1,2 AGAINST Y FORCE TARGET TYPE M
      C                       OF WHICH M=11,20 ARE IN TACTICAL MODE 2
      C     YSPFDG(K,L)       FIRE SUPPRESSION AGAINST Y FORCE
      C                       WEAPON TYPE K IN TACTICAL MODE L=1,2
      C
      C
            DIMENSION  XYPKW(10,20,2),YWPN(10,3),PCYVXZ(10,20,2)
           1,          YSPFDG(10,2),TOTYTG(10,2)
      C
            DO 10 J=1,2
              DO 20 I=1,10
                DO 30 L=1,2
                  DO 40 K=1,10
      C
                    IF(XYPKW(I,K+(L-1)*10,J).GT.0) THEN
                      TOTYTG(I,J) = PCYVXZ(K,I+(J-1)*10,L) * YWPN(K,L+1)
           1            * (1-YSPFDG(K,L)*0.33) + TOTYTG(I,J)
                    END IF
      C
      40          CONTINUE
      30        CONTINUE
      20      CONTINUE
      10    CONTINUE
      C
            RETURN
            DEBUG SUBCHK
            END

N 176 IBANK 61 DBANK
```

DIAMPUBLISH.PCTBL
R1 04/01/82-10:33(0,)

```
C********************** SUBROUTINE PCTBL ***********************
C
C
C
      SUBROUTINE PCTBL(BWDRW,RWDRW,DFRC,PCRVBE,PCRVBW,PCRWVB,
     1                PCBVRE,PCBVRW,PCBWVR,PCRVBC,PCBVRC)
C
C     THIS SUBROUTINE DETERMINES WHICH TWO OF THE SIX
C       VISIBILITY TABLES TO USE IN THE  ATTRITION LOOP
C       BASED ON THE VALUE OF XWTHDR AND YWTHDR
C
C     BWDRW             INDEX FOR BLUE FORCE:  1=ENGAGE, 2=WITHDRAW
C     RWDRW             INDEX FOR RED FORCE:  1=ENGAGE, 2=WITHDRAW
C     DFRC              INDEX:  1=BLUE DEFENDS, 2=RED DEFENDS
C     PCRVBE(I,J,K)     FRACTION OF RED FORCE WEAPON CATEGORY I
C                       VISIBLE TO BLUE FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING ENGAGEMENT
C     PCBVRE(I,J,K)     FRACTION OF BLUE FORCE WEAPON CATEGORY I
C                       VISIBLE TO RED FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING ENGAGEMENT
C     PCRVBW(I,J,K)     FRACTION OF RED FORCE WEAPON CATEGORY I
C                       VISIBLE TO BLUE FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING BLUE FORCE
C                       WITHDRAWAL
C     PCBWVR(I,J,K)     FRACTION OF BLUE FORCE WEAPON CATEGORY I
C                       VISIBLE TO RED FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING BLUE FORCE
C                       WITHDRAWAL
C     PCRWVB(I,J,K)     FRACTION OF RED FORCE WEAPON CATEGORY I
C                       VISIBLE TO BLUE FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING RED FORCE
C                       WITHDRAWAL
C     PCBVRW(I,J,K)     FRACTION OF BLUE FORCE WEAPON CATEGORY I
C                       VISIBLE TO RED FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING RED FORCE
C                       WITHDRAWAL
C
C
      DIMENSION  PCRVBE(4,4,5),PCRVBW(4,4,5),PCRWVB(4,4,5)
     1,          PCBVRE(4,4,5),PCBVRW(4,4,5),PCBWVR(4,4,5)
     2,          PCRVBC(4,4,5),PCBVRC(4,4,5)
C
C
      IF(BWDRW.EQ.2 .AND. RWDRW.EQ.2) THEN
        IF(DFRC.EQ.1) THEN
 1        RWDRW=1
        ELSE
          BWDRW=1
        END IF
      END IF
C
      IF(BWDRW.EQ.1 .AND. RWDRW.EQ.1) THEN
        DO 10 I=1,4
          DO 20 J=1,4
            DO 30 K=1,5
              PCRVBC(I,J,K)=PCRVBE(I,J,K)
              PCBVRC(I,J,K)=PCBVRE(I,J,K)
 30         CONTINUE
 20       CONTINUE
```

```
10        CONTINUE
C
        ELSE IF(BWDRW.EQ.2) THEN
          DO 40 I=1,4
            DO 50 J=1,4
              DO 60 K=1,5
                PCRVBC(I,J,K)=PCRVBW(I,J,K)
                PCBVRC(I,J,K)=PCBWVR(I,J,K)
60            CONTINUE
50          CONTINUE
40        CONTINUE
C
        ELSE
          DO 70 I=1,4
            DO 80 J=1,4
              DO 90 K=1,5
                PCRVBC(I,J,K)=PCRWVB(I,J,K)
                PCBVRC(I,J,K)=PCBVRW(I,J,K)
90            CONTINUE
80          CONTINUE
70        CONTINUE
        END IF
C
        RETURN
        DEBUG  SUBCHK
        AT 1
        END
```

N 344 IBANK 87 DBANK

DIAMPUBLISH.PCWPVS
21 04/01/82-10:33(0,)

```
      C********************** SUBROUTINE PCWPVS **********************
      C
      C
      C
            SUBROUTINE PCWPVS(XCHR,YCHR,PCXVYC,XYRGBD,PCXVYZ)
      C
      C     THIS SUBROUTINE DETERMINES PCXVYZ(I,M,J), THE FRACTION OF X
      C       FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2 VISIBLE TO Y
      C       FORCE WEAPON TYPE M OF WHICH M=11,20 ARE IN TACTICAL
      C       MODE 2
      C
      C     XCHR(I,4)        WEAPON CATEGORY OF X FORCE WEAPON TYPE I:
      C                      DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C     YCHR(K,4)        WEAPON CATEGORY OF Y FORCE WEAPON TYPE K:
      C                      DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
      C     PCXVYC(A,B,C)    FRACTION OF X FORCE WEAPON CATEGORY A
      C                      VISIBLE TO Y FORCE WEAPON CATEGORY B
      C                      IN RANGE BAND C
      C     XYRGBD(I,M,J)    RANGE BANDS FOR X FORCE WEAPON TYPE I IN
      C                      TACTICAL MODE J=1,2 AGAINST Y FORCE WEAPON
      C                      TYPE M OF WHICH M=11,20 ARE IN TACTICAL
      C                      MODE 2
      C
      C
            DIMENSION  XCHR(10,5),YCHR(10,5),PCXVYC(4,4,5),XYRGBD(10,20,2)
           1,          PCXVYZ(10,20,2)
      C
      C
      1     DO 10 J=1,2
              DO 20 I=1,10
                DO 30 L=1,2
                  DO 40 K=1,10
      C
                  IF(XYRGBD(I,K+(L-1)*10,J).EQ.6) THEN
                    PCXVYZ(I,K+(L-1)*10,J) = 0
                  ELSE
                    PCXVYZ(I,K+(L-1)*10,J) =
           1          PCXVYC(XCHR(I,4),YCHR(K,4),XYRGBD(I,K+(L-1)*10,J))
                  END IF
      C
      40          CONTINUE
      30        CONTINUE
      20      CONTINUE
      10    CONTINUE
      C
            RETURN
            DEBUG  SUBCHK
            AT 1
            END
```

N 2(7 IBANK 61 DBANK

```
  DIAMPUBLISH.PKIN
R1    0 /01/82-10:33(0,)
               SUBROUTINE PKIN(BRPK,RBPK,BCHR,RCHR,IBU,IRD,KK15,KK16,NUMB,
              1NUMR,IU)
               DIMENSION IBU(10),IRD(10),PREC(25),BRPK(10,10,5),RBPK(10,10,5)
              1,BCHR(10,5),RCHR(10,5),BNAME(10),RNAME(10)
      C
      C ZERO PK ARRAYS
      C
               DEFINE FILE 15(300,26,U,K15),16(300,26,U,K16)
      CC        PRINT 2002, IU
      2002      FORMAT(1X,'IU   ',I5)
       1        DO 30 I=1,10
               DO 20 J=1,10
               DO 10 K=1,5
               BRPK(I,J,K)=-1.0
               RBPK(I,J,K)=-1.0
       10      CONTINUE
       20      CONTINUE
       30      CONTINUE
      C
      C FILL ARRAY BRPK WITH BLUE VS RED PK
      C
               DO 60 I=1,NUMB
      C
      C FIND PROPER BLUE WEAPON ON PK FILE
      C
               K15=51+(IBU(I)-1)*5
               K16=K15
      C
      C READ IN BLUE RECORDS FOR 5 RANGES
      C
               DO 50 K=1,5
               IF(IU.EQ.1) GO TO 35
               READ(15'K15)NAM1,(PREC(L),L=1,25)
               GO TO 37
       35      READ(16'K16)NAM1,(PREC(L),L=1,25)
      C
      C SELECT PROPER RED WEAPON VULNERABILITIES
      C
      CC        PRINT 2001, NAM1,(PREC(L),L=1,14)
      2001      FORMAT(1X,A4,14F5.2)
      37       DO 40 J=1,NUMR
               IPT=IRD(J)
               IF(PREC(IPT).NE.0.0) BRPK(I,J,K)=PREC(IPT)
       40      CONTINUE
       50      CONTINUE
       60      CONTINUE
      C
      C FILL ARRAY RBPK WITH RED VS BLUE
      C
               DO 90 I=1,NUMR
      C
      C FIND PROPER RED WEAPON ON PK FILE
      C
               K15=176+(IRD(I)-1)*5
               K16=K15
      C
      C READ IN RED RECORDS FOR 5 RANGES
               DO 80 K=1,5
               IF (IU.EQ.1) GO TO 65
```

```
      READ(15'K15) NAM1,(PREC(L),L=1,25)
      GO TO 67
   65 READ(16'K16) NAM1,(PREC(L),L=1,25)
C
C SELECT PROPER BLUE WEAPON VULNERABILITIES
C
   67 DO 70 J=1,NUMB
      IPT=IBU(J)
      IF(PREC(IPT).NE.0) RBPK(I,J,K)=PREC(IPT)
   70  CONTINUE
   80  CONTINUE
   90 CONTINUE
C
C LOAD BLUE WEAPON CHARACTERISTICS
C
      DO 100 I=1,NUMB
      K15=IBU(I)
      K16=K15
      IF(IU.EQ.1) GO TO 95
      READ(15'K15) BNAME(I),ISEN,BCHR(I,2),BCHR(I,3),ICAT, BCHR(I,5)
      GO TO 97
   95  READ(16'K16) BNAME(I),ISEN,BCHR(I,2),BCHR(I,3),ICAT,BCHR(I,5)
   97   BCHR(I,1)=ISEN
      BCHR(I,4)=ICAT
CC    PRINT 1000, BNAME(I),(BCHR(I,J),J=1,5)
  100  CONTINUE
C
C LOAD RED WEAPON CHARACTERISTICS
C
      DO 200 I=1,NUMR
      K15=IRD(I)+25
      K16=K15
      IF(IU.EQ.1) GO TO 150
      READ(15'K15) RNAME(I),ISEN,RCHR(I,2),RCHR(I,3),ICAT,RCHR(I,5)
      GO TO 160
  150 READ(16'K16)RNAME(I),ISEN,RCHR(I,2),RCHR(I,3),ICAT,RCHR(I,5)
  160 RCHR(I,1)=ISEN
      RCHR(I,4)=ICAT
CC    PRINT 1000, RNAME(I),(RCHR(I,J),J=1,5)
  200  CONTINUE
      CLOSE(15)
      CLOSE(16)
       KK15=K15
 1000 FORMAT(1X,A4,5F10.3)
      KK16=K16
      RETURN
C     DEBUG SUBCHK,SUBTRACE
C     AT 1
      END

N 311 IBANK 316 DBANK
```

```
  DIAMPUBLISH.PKWP
RI    04/01/82-10:33(0,1)
      C*********************** SUBROUTINE PKWP *********************
      C
      C
      C
               SUBROUTINE PKWP(XYPK,XYRGBD,XYPKWP)
      C
      C        THIS SUBROUTINE DETERMINES XYPKWP(I,M,J), THE SSPK FOR X
      C          FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2 AGAINST Y FORCE
      C          TARGET TYPE M OF WHICH M=11,20 ARE IN TACTICAL MODE 2
      C
      C        XYPK(I,K,C)      SSPK FOR X FORCE WEAPON TYPE I VERSUS Y
      C                         FORCE TARGET TYPE K IN RANGE BAND C
      C        XYRGBD(I,M,J)    RANGE BAND FOR X FORCE WEAPON TYPE I IN
      C                         TACTICAL MODE J=1,2 AGAINST Y FORCE TARGET
      C                         TYPE M OF WHICH M=11,20 ARE TACTICAL MODE 2
      C
      C
               DIMENSION  XYPK(10,10,5),XYRGBD(10,20,2),XYPKWP(10,20,2)
      C
      C
      1        DO 10 J=1,2
                 DO 20 I=1,10
                   DO 30 L=1,2
                     DO 40 K=1,10
      C
                       IF(XYRGBD(I,K+(L-1)*10,J).EQ.0) THEN
                         XYPKWP(I,K+(L-1)*10,J) = 0
                       ELSE
                         XYPKWP(I,K+(L-1)*10,J)=XYPK(I,K,XYRGBD(I,K+(L-1)*10,J))
                       END IF
      C
      40             CONTINUE
      30           CONTINUE
      20         CONTINUE
      10       CONTINUE
      C
               RETURN
               DEBUG  SUBCHK
               AT 1
               END

N 166 IBANK 45 DBANK
```

DIAMPUBLISH.REMNT
R1 04/01/87-10:33 (0,1)

```
C**********************  SUBROUTINE REMNT  **********************
C
C
C
      SUBROUTINE REMNT(XCHR,XWPN,XDMMAX,XDMV,XDMRTO,XNUMDM,
     1                 DXFXWP)
C
C     THIS SUBROUTINE MOUNTS DISMOUNTED TROOPS FOR X FORCE
C
C     XTOTDM        TOTAL NUMBER OF DISMOUNTED TROOPS
C     XTOTMC        TOTAL NUMBER OF TROOP CARRIERS
C     XCHR(I,4)     CATEGORY OF X FORCE WEAPON TYPE I:
C                   DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C     XWPN(I,J+1)   NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
C                   MODE J=1,2
C     XDMMAX        MAXIMUM NUMBER OF TROOPS ALLOWED IN TROOP CARRIER
C     XDMV          INDEX FOR X FORCE:  1=DISMOUNTED, 2=MOUNTED
C     XDMRTO        RATIO OF DISMOUNTED TROOPS TO CARRIERS
C     XNUMDM        NUMBER OF TROOPS THAT MOUNT PER CARRIER
C     DXFXWP(I,J)   DISTANCE FROM X FORCE CENTROID TO X FORCE
C                   WEAPON TYPE I IN TACTICAL MODE J=1,2
C
C
      DIMENSION  XCHR(10,5),DXFXWP(10,2),XWPN(10,3)
C
C
      IF(XDMRTO.LE.0) THEN
C       DO NOT REMOUNT
        RETURN
C
      ELSE IF(XDMRTO.LE.XDMMAX) THEN
1       DO 10 I=1,10
          IF(XCHR(I,4).EQ.1) THEN
            IF(XWPN(I,3).GT.0) THEN
              XWPN(I,2) = XWPN(I,3)
              XWPN(I,3) = 0
              DXFXWP(I,1)  =  -9999999
              DXFXWP(I,2)  =  -9999999
            END IF
          END IF
10      CONTINUE
        XNUMDM  =  XDMRTO
C
      ELSE
        DO 20 I=1,10
          IF(XCHR(I,4).EQ.1) THEN
            IF(XWPN(I,3).GT.0) THEN
              XWPN(I,2)  =  XWPN(I,3) * XDMMAX/XDMRTO
              XWPN(I,3)  =  XWPN(I,3) - XWPN(I,2)
              DXFXWP(I,1)  =  -9999999
            END IF
          END IF
20      CONTINUE
        XNUMDM  =  XDMMAX
      END IF
C
C     CHANGE TROOP CARRIER MODE
25      DO 30 I=1,10
          IF(XCHR(I,4).EQ.3) THEN
```

```
                  IF(XWPN(I,3).GE.0) THEN
                    XWPN(I,2) = XWPN(I,3)
                    XWPN(I,3) = 0
                    DXFXWP(I,1)  =  DXFXWP(I,2)
                    DXFXWP(I,2)  =  -9999999
                  END IF
                END IF
   30         CONTINUE
C
          XDMV = 1
C
          RETURN
          DEBUG  SUBCHK
          AT 1
          END
```

N 321 IBANK 43 DBANK

```
 DIAMPUBLISH.REPRT
R1    04/01/82-10:33(0,1
      C************************  SUBROUTINE REPRT  **********************
      C
      C
      C
            SUBROUTINE REPRT(IGAMTM,RBKVLS,BRKVLS,BNUM,RNUM,BDEAD,
           1                  RDEAD,BWPN,RWPN,BDSNG,RDSNG,BWDRW,RWDRW,
           1                  BRDSUM,RRDSUM,DSTMIN)
      C
      C     THIS SUBROUTINE PRINTS A DIAM BATTLE STATUS REPORT.  THE
      C       REPORT LISTS THE KILLER VICTIM SCOREBOARDS AND ALLOWS
      C       THE GAMER TO STOP THE GAME.  THE FOLLOWING VARIABLES
      C       ARE INPUT
      C
      C     IGAMTM        GAME TIME IN MINUTES
      C     RBKVLS(I,J)   LOSSES OF BLUE WEAPON TYPE J FROM RED WEAPON
      C                   TYPE I
      C     BRKVLS(I,J)   LOSSES OF RED WEAPON TYPE J FROM BLUE WEAPON
      C                   TYPE I
      C     BNUM          NUMBER OF BLUE WEAPON SYSTEM TYPES
      C     RNUM          NUMBER OF RED WEAPON SYSTEM TYPES
      C     BDEAD(I,J)    TOTAL NUMBER OF BLUE WEAPON TYPE I IN TACTICAL
      C                   MODE J=1,2
      C     RDEAD(I,J)    TOTAL NUMBER OF RED WEAPON TYPE I IN TACTICAL
      C                   MODE J=1,2
      C     BDSNG         BLUE FORCE INDEX:  ENGAGING=1, DISENGAGE=2
      C     RDSNG         RED FORCE INDEX:  ENGAGING=1, DISENGAGE=2
      C     BWPN(I,J+1)   NUMBER OF BLUE FORCE WEAPON TYPE I IN TACTICAL
      C                   MODE J=1,2
      C     RWPN(I,J+1)   NUMBER OF RED FORCE WEAPON TYPE I IN TACTICAL
      C                   MODE J=1,2
      C     BWDRW         INDEX FOR BLUE FORCE:  ENGAGING=1, WITHDRAWING=2
      C     RWDRW         INDEX FOR RED FORCE:  ENGAGING=1, WITHDRAWING=2
      C     DSTMIN        MINIMUM DISTANCE BETWEEN OPPOSING WEAPONS
      C
      C
            COMMON/REED/JDAY1,XINX(4),ICARD(20),IHY,IHN,IHB,IHYES,IHNO
      C
            DIMENSION  RBKVLS(12,13),BRKVLS(12,13),BDEAD(10,2),RDEAD(10,2),
           1           DEAD(10),IAM(2),BWPN(10,3),RWPN(10,3),IBH(10),
           1           IRH(10),BRDSUM(10,2),RRDSUM(10,2)
      C
      C
            PRINT 1000, IGAMTM
            PRINT 1010, DSTMIN
      1     IBNUM=BNUM
            IRNUM=RNUM
            IAM(1)='ARTY'
            IAM(2)='MINE'
      C
      C     INTEGERIZE BLUE JIFFY POINTERS
              DO 10 I=1,IBNUM
                IBH(I) = BWPN(I,1)
      10      CONTINUE
      C
      C     INTEGERIZE RED JIFFY POINTERS
              DO 20 I=1,IRNUM
                IRH(I) = RWPN(I,1)
      20      CONTINUE
      C
```

```
C      PRINT BLUE KILLER/RED VICTIM INFORMATION
C        PRINT HEADINGS
           PRINT 2000
           PRINT 3000, (IRH(I),I=1,IRNUM)
C        PRINT RED DIRECT FIRE LOSSES AND ROUNDS FIRED
           DO 30 I=1,IBNUM
             PRINT 4000, IBH(I),(BRKVLS(I,J),J=1,IRNUM)
             PRINT 4005, (BRDSUM(I,K),K=1,2)
 30        CONTINUE
C        PRINT RED ARTILLERY AND MINE LOSSES
           DO 40 I=1,2
             PRINT 4010, IAM(I),(BRKVLS(I+10,J),J=1,IRNUM)
 40        CONTINUE
C        SUM DEAD REDS AND PRINT SUM
           DO 50 I=1,IRNUM
             DEAD(I) = RDEAD(I,1) + RDEAD(I,2)
 50        CONTINUE
           PRINT 5000, (DEAD(I),I=1,IRNUM)
C
C      PRINT RED KILLER/BLUE VICTIM INFORMATION
C        PRINT HEADINGS
           PRINT 6000
           PRINT 3000, (IBH(I),I=1,IBNUM)
C        PRINT BLUE DIRECT FIRE LOSSES AND ROUNDS FIRED
           DO 60 I=1,IRNUM
             PRINT 4000, IRH(I),(RBKVLS(I,J),J=1,IBNUM)
             PRINT 4005, (RRDSUM(I,K),K=1,2)
 60        CONTINUE
C        PRINT BLUE ARTILLERY AND MINE LOSSES
           DO 70 I=1,2
             PRINT 4010, IAM(I),(RBKVLS(I+10,J),J=1,IBNUM)
 70        CONTINUE
C        SUM DEAD BLUES AND PRINT SUM
           DO 80 I=1,IBNUM
             DEAD(I) = BDEAD(I,1) + BDEAD(I,2)
 80        CONTINUE
           PRINT 5000, (DEAD(I),I=1,IBNUM)
C
C      QUESTION GAMER FOR DISENGAGEMENT
         IF(BWDRW.EQ.1 .AND. RWDRW.EQ.1) THEN
   90      PRINT 7000
           CALL REED4
           IOUT = XINX(1)
           IF(IOUT.LT.1 .OR. IOUT.GT.3) THEN
             GO TO 90
           ELSE IF(IOUT.EQ.2) THEN
             BDSNG = 2
           ELSE IF(IOUT.EQ.3) THEN
             RDSNG = 2
           ELSE
             BDSNG = 1
             RDSNG = 1
           END IF
         END IF
C
 1000  FORMAT(1X,'DIAM INFANTRY STATUS REPORT',10X,
      1'BATTLE TIME IS ',I3,2X,'MINUTES')
 1010  FORMAT(1X,'MINIMUM DISTANCE BETWEEN OPPOSING WEAPONS IS',
      1 F6.1,' METERS')
 2000  FORMAT(1X,//,2X,'BLUE',23X,' RED LOSSES',25X,'BLUE RNDS',
      1 /,1X,'KILLER',52X,'PRIMARY/SECONDARY')
```

```
 3000  FORMAT(6X,10(I6))
 4000  FORMAT(3X,I4,12F6.1)
 4005  FORMAT(55X,2F12.1)
 4010  FORMAT(3X,A4,10F6.1)
 5000  FORMAT(1X,/,2X,'TOTAL',10F6.1)
 6000  FORMAT(1X,//,2X,' RED',23X,'BLUE LOSSES',23X,' RED RNDS',
      1 /,1X,'KILLER',52X,'PRIMARY/SECONDARY')
 7000  FORMAT(//,2X,'DO YOU WISH TO WITHDRAW FORCES?  ',
      1'1=NO  2=BLUE WITHDRAWS  3=RED WITHDRAWS')
 8000  FORMAT(I1)
 C
       RETURN
       DEBUG SUBCHK
       AT 1
       END

N 334 IBANK 621 DBANK 30 COMMON
```

DIAMPUBLISH.RNDCK
R1 04/01/82-10:33(0,)

```
C********************** SUBROUTINE RNDCK *********************
C
C
C
      SUBROUTINE RNDCK(XWPN,XCHR,YCHR,XNUM,YNUM,XRDFR,XAMO,XRDSUM)
C
C     THIS SUBROUTINE COMPARES THE AMOUNT OF ROUNDS TO FIRE WITH
C       THE NUMBER OF ROUNDS AVAILABLE TO FIRE.  IF ROUNDS FIRED
C       FROM XRDFR ARE GREATER THAN THE ROUNDS AVAILABLE TO FIRE
C       IN XAMO, THEN THE ROUNDS ARE REAPPORTIONED SO THAT THE
C       TOTAL NUMBER OF ROUNDS TO FIRE DOES NOT EXCEED ONE FOURTH
C       OF THE CURRENTLY AVAILABLE ROUNDS.
C
C     FOR WEAPON SYSTEMS THAT CARRY RIFLES AS SECONDARY WEAPONS,
C       THE NUMBER OF ROUNDS FOR RIFLES IS INCREASED TO REFLECT
C       RIFLE FIRING
C
C     XWPN(I,J)      NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
C                    MODE J=2,3
C     XAMO(I,J)      AMMUNITION FOR X FORCE WEAPON TYPE I OF WHICH
C                    J=1 IS FOR THE PRINCIPAL WEAPON, AND J=2 IS
C                    FOR RIFLES.  THIS ARRAY CONTAINS THE AVERAGE OF
C                    AMMO AVAILABLE PER WEAPON
C     XCHR(I,4)      WEAPON CATEGORY FOR X FORCE WEAPON TYPE I:
C                    DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C     YCHR(I,4)      WEAPON CATEGORY FOR Y FORCE WEAPON TYPE I:
C                    DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C     XCHR(I,5)      TIME TO AIM, RELOAD, AND FIRE FOR X FORCE
C                    WEAPON TYPE I
C     XRDFR(I,J,K)   ROUNDS TO FIRE FOR X FORCE WEAPON TYPE
C                    I IN TACTICAL MODE K=1,2 AGAINST TARGETS J OF
C                    WHICH J=11,20 ARE TACTICAL MODE 2
C     XRDSUM(I,J)    TOTAL ROUNDS FIRED FOR WEAPON TYPE I OF
C                    WHICH J=1 IS PRINCIPAL AMMUNTION AND J=2
C                    IS RIFLE AMMUNITION
C
C
      DIMENSION  XAMO(10,2),XWPN(10,3),YCHR(10,5),XCHR(10,5)
     1,           XRDFR(10,20,2),XRDSUM(10,2)
C
C
1     IXNUM=XNUM
      IYNUM=YNUM
C     THIS LOOP REAPPORTIONS ALL NON-RIFLE ROUNDS FOR EACH FIRER
      DO 100 I=1,IXNUM
C     SUM TOTAL ROUNDS FIRED AT ALL TARGETS
      IF(XWPN(I,2).GT.0.0) GO TO 5
      IF(XWPN(I,3).LE.0.0) GO TO 100
5     SUM =0.0
C
C     SET RIFLE FLAG
      IRIFLE=0
      IF(XAMO(I,2).NE.0.0) IRIFLE=1
C     RUN THROUGH ALL TARGETS FOR NON-RIFLE FIRING
      DO 20 J=1,IYNUM
C     CHECK FOR PERSONNEL TYPE TARGET.  IF PERSON AND RIFLE
C     ROUNDS AVAILABLE THEN MUST FIRE RIFLE
      IF(YCHR(J,4).EQ.1 .AND. IRIFLE.EQ.1) GO TO 20
C     SUM TOTAL ROUNDS FIRED AT THIS TARGET BY FIRERS IN
```

```
C     TACTICAL MODES 1 AND 2
      DO 10 K=1,2
        SUM=XRDFR(I,J,K)+XRDFR(I,J+10,K) + SUM
   10 CONTINUE
   20 CONTINUE
C
C     COMPARE NUMBER OF ROUNDS FIRED WITH NUMBER AVAILABLE.
C     FIRST TOTAL NUMBER OF WEAPONS ALIVE TO FIRE
      TWPN = XWPN(I,2)
      IF(XWPN(I,3).GT.0.0) TWPN = TWPN + XWPN(I,3)
C
C
C     COMPUTE THE NUMBER OF NON-RIFLE ROUNDS AVAILABLE
C     PER WEAPON
      AVL = TWPN * XAMO(I,1) * 0.25
C     IF NUMBER FIRED LESS THAN AVAILABLE REDUCE ROUNDS
      IF(SUM.LE.AVL) GO TO 50
C
C     REAPPORTION THE NUMBER AVAILABLE OVER ALL FIRED
      DO 40 J=1,IYNUM
C     IGNORE PERSONNEL IF RIFLES ARE AVAILABLE
      IF(YCHR(J,4).EQ.1 .AND. IRIFLE.EQ.1) GO TO 40
        DO 30 K=1,2
        XRDFR(I,J,K) = XRDFR(I,J,K)/SUM  * AVL
        XRDFR(I,J+10,K) = XRDFR(I,J+10,K)/SUM  * AVL
   30   CONTINUE
   40   CONTINUE
C
C     UPDATE XAMO ARRAY
      XAMO(I,1) = XAMO(I,1) * 0.75
      GO TO 55
C     COMPUTE THE AVERAGE NUMBER OF ROUNDS LOST
   50 XAMO(I,1) = XAMO(I,1) - SUM/TWPN
C
C     IF NO RIFLE TOTAL ROUNDS
   55 IF(IRIFLE.EQ.0) GO TO 94
C     CALCULATE RIFLE SHOTS AND SUM ALL SHOTS
      SUM = 0.0
      DO 70 J=1,IYNUM
        IF(YCHR(J,4) .NE.1.0) GO TO 70
        DO 60 K=1,2
          SUM = XRDFR(I,J,K) + XRDFR(I,J+10,K) + SUM
   60   CONTINUE
   70 CONTINUE
C
      IF(SUM.EQ.0.0) GO TO 94
C     COMPUTE NUMBER OF WEAPONS AVAILABLE
      TWPN = XWPN(I,2)
      IF(XWPN(I,3).GT.0) TWPN= TWPN + XWPN(I,3)
C
C     COMPUTE NUMBER OF RIFLE ROUNDS FIRED TAKE AIM
C     FIRE RELOAD TIME FOR THIS PRINCIPAL WEAPON ARE
C     DIVIDED BY 3 SECONDS FOR AIM, FIRE, AND RELOAD
C     FOR RIFLE
      AVL = XAMO(I,2) * TWPN * 0.25
      IF(SUM*XCHR(I,5)/3.0 .LT. AVL) AVL=SUM*XCHR(I,5)/3.0
C
C     REAPPORTION RIFLE FIRINGS
      DO 90 J=1,IYNUM
C     CHECK FOR PERSONNEL TARGET
      IF (YCHR(J,4).NE.1) GO TO 90
```

```
              DO 80 K=1,2
              XRDFR(I,J,K) = XRDFR(I,J,K)/SUM * AVL
              XRDFR(I,J+10,K) = XRDFR(I,J+10,K)/SUM * AVL
    80        CONTINUE
    90        CONTINUE
              XAMO(I,2) = XAMO(I,2) - AVL/TWPN
    C
    C         SUM ROUNDS FIRED
    94          DO 95 J=1,IYNUM
                  K=1
                  IF(IRIFLE.EQ.1 .AND. YCHR(J,4).EQ.1) K=2
                    XRDSUM(I,K) = XRDFR(I,J,1) + XRDFR(I,J+10,2) + XRDSUM(I,K)
             1          + XRDFR(I,J+10,1) + XRDFR(I,J,2)
    95          CONTINUE
    100       CONTINUE
    C
              RETURN
              DEBUG SUBCHK
              AT 1
              END
```

N 761 IBANK 85 DBANK

```
DIAMPUBLISH.RNDFRD
R1    04/19/82-11:50(0,)
      C*********************  SUBROUTINE RNDFRD  *********************
      C
      C
      C
            SUBROUTINE RNDFRD(XTMKLL,TOTYTG,XWPN,YWPN,PCXVYZ,PCYVXZ,
           1                XDFAT,XWDRW,XRDKLL,YSPFDG,XSPFDG,XRDFR)
      C
      C     THIS SUBROUTINE CALCULATES XRDFR(I,M,J), ROUNDS TO FIRE BY X
      C       FORCE WEAPON TYPES I IN TACTICAL MODE J=1,2 TO Y FORCE
      C       TARGET TYPES M OF WHICH M=11,20 ARE IN TACTICAL MODE 2
      C
      C     XDFAT              INDEX FOR X FORCE:  1=DEFENDING, 2=ATTACKING
      C     XWDRW              INDEX FOR X FORCE:  1=ENGAGING, 2=WITHDRAWING
      C     XTMKLL(I,M,J)      TIME TO KILL FOR X FORCE WEAPON TYPE I
      C                        IN TACTICAL MODE J=1,2 AGAINST TARGET
      C                        TYPE M OF WHICH M=11,20 ARE IN TACTICAL
      C                        MODE 2
      C     TOTYTG(I,J)        TOTAL NUMBER OF Y FORCE TARGETS FOR
      C                        X FORCE WEAPON TYPE I IN TACTICAL
      C                        MODE 2
      C     XWPN(I,J+1)        NUMBER OF X FORCE WEAPON TYPE K IN
      C                        TACTICAL MODE L=1,2
      C     YWPN(K,L+1)        NUMBER OF Y FORCE WEAPON TYPE K IN
      C                        TACTICAL MODE L=1,2
      C     PCYVXW(K,N,L)      PERCENT VISIBLE OF Y FORCE WEAPON
      C                        TYPE K IN TACTICAL MODE L=1,2 TO X
      C                        FORCE WEAPON TYPE N OF WHICH N=11,20
      C                        ARE IN TACTICAL MODE 2
      C     PCXVYW(I,M,J)      PERCENT VISIBLE OF X FORCE WEAPON
      C                        TYPE I IN TACTICAL MODE J=1,2 TO
      C                        Y FORCE WEAPON TYPE M OF WHICH M=11,20
      C                        ARE IN TACTICAL MODE 2
      C     XRDKLL(I,M,J)      ROUNDS TO KILL FOR X FORCE WEAPON
      C                        TYPE I IN TACTICAL MODE J=1,2
      C                        AGAINST Y FORCE TARGET TYPES M
      C                        OF WHICH M=11,20 ARE IN TACTICAL
      C                        MODE 2
      C     XSPFDG(I,J)        FIRE SUPPRESSION AGAINST X FORCE
      C                        WEAPON TYPE I IN TACTICAL MODE J=1,2
      C     YSPFDG(K,L)        FIRE SUPPRESSION AGAINST Y FORCE
      C                        WEAPON TYPE K IN TACTICAL MODE L=1,2
      C     FRCTN              FRACTION INDICATING TRUE FIRINGS
      C
      C
            DIMENSION  XTMKLL(10,20,2),TOTYTG(10,2),YWPN(10,3),XWPN(10,3)
           1,          PCYVXZ(10,20,2),XRDFR(10,20,2),XRDKLL(10,20,2)
           2,          XSPFDG(10,2),PCXVYZ(10,20,2),YSPFDG(10,2)
      C
      C
            FRCTN = 0.5
            IF(XDFAT.EQ.2) THEN
              FRCTN = 0.25
            END IF
            IF(XWDRW.EQ.2) THEN
              FRCTN = 0.20
            END IF
      C
      100   DO 10 J=1,2
              DO 20 I=1,10
```

```
                  DO 30 L=1,2
                    DO 40 K=1,10
      C
                      XSPDG = 1 - XSPFDG(I,J)
                      YSPDG = 1 - YSPFDG(K,L)*0.33
                      RDKLL = XRDKLL(I,K+(L-1)*10,J)
                      TMKLL = XTMKLL(I,K+(L-1)*10,J)
                      TOTTG = TOTYTG(I,J)
                      YWPNN = YWPN(K,L+1) * PCYVXZ(K,I+(J-1)*10,L)
                      XWPNN = XWPN(I,J+1) * PCXVYZ(I,K+(L-1)*10,J)
      C
                      IF(TOTTG.NE.0 .AND. TMKLL.NE.0)  THEN
                        RDFR = (((RDKLL/TMKLL)*XWPNN*YWPNN)/TOTTG) *XSPDG*YSPDG
                      ELSE
                        RDFR = 0
                      END IF
                      XRDFR(I,K+(L-1)*10,J) = RDFR * FRCIN
      C
      40            CONTINUE
      30          CONTINUE
      20        CONTINUE
      10      CONTINUE
      C
              RETURN
              DEBUG SUBCHK
              AT 100
              END
```

'N 3?2 IBANK 110 DBANK

```
DIAMPUBLISH.RNDKLL
R1    04/01/82-10:33(0,)
C************************** SUBROUTINE RNDKLL *******************
C
C
C
      SUBROUTINE RNDKLL(XYPKW,XRDKLL)
C
C     THIS SUBROUTINE CALCULATES XRDKLL(I,M,J), ROUNDS TO KILL
C       FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2
C       AGAINST Y FORCE TARGET TYPES M OF WHICH M=11,20
C       ARE IN TACTICAL MODE 2
C
C     XYPKW(I,M,J)     PROBABILITY OF KILL (SSPK) FOR X FORCE
C                      WEAPON TYPES I IN TACTICAL MODE J=1,2
C                      AGAINST Y FORCE TARGET TYPE M OF
C                      WHICH M=11,20 ARE IN TACTICAL MODE 2
C
C
C
      DIMENSION XYPKW(10,20,2),XRDKLL(10,20,2)
C
C
  100 DO 10 J=1,2
        DO 20 I=1,10
          DO 30 L=1,2
            DO 40 K=1,10
C
              PK=XYPKW(I,K+(L-1)*10,J)
              IF(PK.GT.0) THEN
                RDKLL=1/PK
              ELSE
                RDKLL=0
              END IF
              XRDKLL(I,K+(L-1)*10,J) = RDKLL
C
   40       CONTINUE
   30     CONTINUE
   20   CONTINUE
   10 CONTINUE
C
      RETURN
      DEBUG SUBCHK
      AT 100
      END

N 106 IBANK 36 DBANK
```

```
DIAMPUBLISH.RNGBND
?1    04/01/82-10:33(0,1)
C********************** SUBROUTINE RNGBND **********************
C
C
C
          SUBROUTINE RNGBND(DBWRWP,BRRGBD)
C
C         THIS SUBROUTINE CALCULATES BRRGBD(I,J,K), THE RANGE BANDS FOR
C           EACH BLUE FORCE WEAPON TYPE I IN TACTICAL MODE K=1,2 TO EACH REI
C           FORCE WEAPON TYPE J OF WHICH J=11,20 ARE IN TACTICAL MODE 2
C
C         DBWRWP(I,J,K)   DISTANCE FROM BLUE FORCE WEAPON TYPE I IN TACTICAI
C                         MODE K=1,2 TO RED FORCE WEAPON TYPE J OF WHICH
C                         J=11,20 ARE IN TACTICAL MODE 2
C
C
          DIMENSION  DBWRWP(10,20,2),BRRGBD(10,20,2)
C
C
1         DO 10 K=1,2
            DO 20 I=1,10
              DO 30 J=1,20
C
                ABSDST = ABS(DBWRWP(I,J,K))
C
                IF(ABSDST.GT.4000) THEN
                  IBAND=6
                ELSE IF(ABSDST.GE.0 .AND. ABSDST.LE.200) THEN
                  IBAND=1
                ELSE IF(ABSDST.GT.200 .AND. ABSDST.LE.400) THEN
                  IBAND=2
                ELSE IF(ABSDST.GT.400 .AND. ABSDST.LE.600) THEN
                  IBAND=3
                ELSE IF(ABSDST.GT.600 .AND. ABSDST.LE.800) THEN
                  IBAND=4
                ELSE
                  IBAND=5
                END IF
C
                BRRGBD(I,J,K) = IBAND
C
30            CONTINUE
20          CONTINUE
10        CONTINUE
C
          RETURN
          DEBUG  SUBCHK
          AT 1
          END

N 127 IBANK 36 DBANK
```

```
 DIAMPUBLISH.RNGDST
R1   04/01/82-10:33(0,)
      C*********************  SUBROUTINE RNGDST  *********************
      C
      C
      C
            SUBROUTINE RNGDST(BRRGBD,RBRGBD,DBWRWP,DRWBWP)
      C
      C     THIS SUBROUTINE DETERMINES RED FORCE WEAPON TO BLUE FORCE
      C       WEAPON DISTANCES AND RANGES GIVEN THE DISTANCES AND
      C       RANGES FROM BLUE FORCE WEAPONS TO RED FORCE WEAPONS
      C
      C     BRRGBD(I,M,J)   RANGE BANDS FROM BLUE FORCE WEAPON TYPE I IN
      C                     TACTICAL MODE J=1,2 TO RED FORCE WEAPON TYPE M
      C                     OF WHICH M=11,20 ARE IN TACTICAL MODE 2
      C     RBRGBD(K,N,L)   RANGE BANDS FROM RED FORCE WEAPON TYPE K IN
      C                     TACTICAL MODE L=1,2 TO BLUE FORCE WEAPON TYPE
      C                     N OF WHICH N=11,20 ARE IN TACTICAL MODE 2
      C     DBWRWP(I,M,J)   DISTANCE FROM BLUE FORCE WEAPON TYPE I IN
      C                     TACTICAL MODE J=1,2 TO RED FORCE WEAPON TYPE
      C                     M OF WHICH M=11,20 ARE IN TACTICAL MODE 2
      C     DRWBWP(K,N,L)   DISTANCE FROM RED FORCE WEAPON TYPE K IN
      C                     TACTICAL MODE K=1,2 TO BLUE FORCE WEAPON TYPE
      C                     N OF WHICH N=11,20 ARE IN TACTICAL MODE 2
      C
      C
            DIMENSION  BRRGBD(10,20,2),RBRGBD(10,20,2),
          1            DBWRWP(10,20,2),DRWBWP(10,20,2)
      C
      C
      1     DO 10 J=1,2
              DO 20 I=1,10
                DO 30 L=1,2
                  DO 40 K=1,10
      C
                    RBRGBD(K,I+(J-1)*10,L) = BRRGBD(I,K+(L-1)*10,J)
                    DRWBWP(K,I+(J-1)*10,L) = DBWRWP(I,K+(L-1)*10,J)
      C
      40          CONTINUE
      30        CONTINUE
      20      CONTINUE
      10    CONTINUE
      C
            RETURN
            DEBUG  SUBCHK
            AT 1
            END

N 149 IBANK 51 DBANK
```

DIAMPUBLISH.SPDG
R1   04/01/82-10:33(0,)

```
C*********************** SUBROUTINE SPDG **********************
C
C
C
          SUBROUTINE SPDG(XWDRW,YWDRW,XDFAT,XCHR,EXCLSS,EYCLSS,XARTSP,
         1                  XMNLSS,XSPFDG,XSPMDG)
C
C         THIS SUBROUTINE CALCULATES XSPFDG(I,M,J) AND XSPMDG(I,M,J),
C           FIRE AND MOVEMENT SUPPRESSION FACTORS FOR X FORCE WEAPON
C           TYPE I IN TACTICAL MODE J=1,2, FROM THE OPPOSING WEAPON
C           FORCE TYPE M OF WHICH M=11,20 ARE IN TACTICAL MODE 2
C
C         XWDRW             INDEX FOR X FORCE:  ENGAGING=1, WITHDRAWING=2
C         YWDRW             INDEX FOR Y FORCE:  ENGAGING=1, WITHDRAWING=2
C         XDFAT             INDEX FOR X FORCE:  DEFENDING=1, ATTACKING=2
C         XCHR(I,4)         WEAPON CATEGORY FOR X FORCE WEAPON TYPE:
C                           DISMOUNTED=1, MORTARS=2, LIGHT=3, HEAVY=4
C         EXCLSS(I,M,J)     THE EXPECTED COMMITTEE LOSSES FOR X FORCE
C                           TARGET TYPES I IN TACTICAL MODE J=1,2 FROM
C                           OPPOSING FORCE WEAPON TYPES M OF WHICH M=11,20
C                           ARE IN TACTICAL MODE 2
C         EYCLSS(K,N,L)     THE EXPECTED COMMITTEE LOSSES FOR Y FORCE
C                           TARGET TYPES K IN TACTICAL MODE L=1,2 FROM
C                           OPPOSING FORCE WEAPON TYPES N OF WHICH N=11,20
C                           ARE IN TACTICAL MODE 2
C         XARTSP(I,J)       ARTILLERY LOSSES FOR SUPPRESSION FOR X FORCE
C                           WEAPON TYPE I IN TACTICAL MODE J=1,2
C         XMNLSS(I,J)       MINEFIELD LOSSES FOR X FORCE WEAPON TYPE I IN
C                           TACTICAL MODE J=1,2
C                           TACTICAL MODE J=1,2
C
C
          DIMENSION  XCHR(10,5),EXCLSS(10,20,2),EYCLSS(10,20,2),
         1           XSPFDG(10,2),XSPMDG(10,2),COEF(10,2),
         1           XTOTCL(10,2),XARTSP(10,2),XTOTCF(10,2),
         1           XMNLSS(10,2)
C
C
C         INITIALIZE COEFFICIENTS BASED ON WEAPON CATEGORY
1           DO 10 I=1,10
              IF(XCHR(I,4).EQ.4) THEN
                COEF(I,1) = 1
                COEF(I,2) = 1
              ELSE IF(XCHR(I,4).EQ.2)THEN
                COEF(I,1) = 2.86
                COEF(I,2) = 2.86
              ELSE
                COEF(I,1) = 2.86
                COEF(I,2) = 2.86
              END IF
10          CONTINUE
C
C         ZERO OUT ARRAYS
            VAR=0
            CALL INIT1(XTOTCF,VAR)
            CALL INIT1(XTOTCL,VAR)
C
C         TOTAL LOSSES INFLICTED BY X FORCE WEAPON TYPES
C         TOTAL LOSSES OF X FORCE WEAPON TYPES
```

```
              DO 40 I=1,10
                DO 50 J=1,2
                  DO 60 K=1,10
                    DO 70 L=1,2
                      XTOTCF(I,J) = XTOTCF(I,J) + EYCLSS(K,I+(J-1)*10,L)
                      XTOTCL(I,J) = XTOTCL(I,J) + EXCLSS(I,K+(L-1)*10,J)
       70             CONTINUE
       60           CONTINUE
       50         CONTINUE
       40       CONTINUE
       C
       C      ADD IN ARTILLERY LOSSES FOR SUPPRESSION AND MINE LOSSES
              DO 80 I=1,10
                DO 90 J=1,2
                  XTOTCL(I,J) = XTOTCL(I,J) + XARTSP(I,J) + XMNLSS(I,J)
       90       CONTINUE
       80     CONTINUE
       C
       C      CALCULATE SUPPRESSION
              DO 100 I=1,10
                DO 110 J=1,2
                  IF(XTOTCF(I,J).GT.0) THEN
                    RATIO = XTOTCL(I,J) / XTOTCF(I,J)
                    IF(XDFAT.EQ.1) THEN
                      IF(XWDRW.EQ.1 .AND. YWDRW.EQ.1) THEN
                        FSP = COEF(I,J) * (2.06 * RATIO + 1.54) / 100
                      ELSE
                        FSP = COEF(I,J) * (1.06 * RATIO + .14) / 100
                      END IF
                    ELSE
                      IF(XWDRW.EQ.1 .AND. YWDRW.EQ.1) THEN
                        FSP = COEF(I,J) * (8. * RATIO**1.5 + 3.28) / 100
                      ELSE
                        FSP = COEF(I,J) * (2.5 * RATIO**1.5 + .5) / 100
                      END IF
                    END IF
                    XSPFDG(I,J) = AMIN1(.8,FSP)
                    XSPMDG(I,J) = AMIN1(.9,FSP)
                  ELSE
                    XSPFDG(I,J) = 0
                    XSPMDG(I,J) = 0
                  END IF
      110       CONTINUE
      100     CONTINUE
       C
              RETURN
              DEBUG SUBCHK
              AT 1
              END
```

N 493 IBANK 185 DBANK

DIAMPUBLISH.TACDSM
R1 04/01/82-10:33(0,)

```
C****************** SUBROUTINE TACDSM **************************
C
C
C
            SUBROUTINE TACDSM(XDMV,XCHR,YCHR,XWPN,DXFXWP,DXWYWP,XTACA)
C
C           THIS SUBROUTINE ALTERS THE TACTICAL MODE OF ONLY LIGHT
C             CATEGORY WEAPON TYPES IN THE ATTACKING FORCE.  WHEN
C             A SPECIFIED OPPOSING WEAPON CATEGORY IS WITHIN A
C             SPECIFIED DISTANCE, THE LIGHT CATEGORY CAN DISMOUNT
C             INFANTRY.
C
C
C           XDMV            INDEX FOR X FORCE:  1=MOUNTED, 2=DISMOUNTED
C           XCHR(I,4)       CATEGORY OF X FORCE WEAPON TYPE I:
C                           1=DISMOUNTED, 2=MORTARS, 3=LIGHT, 4=HEAVY
C           YCHR(K,4)       CATEGORY OF Y FORCE WEAPON TYPE K:
C                           1=DISMOUNTED, 2=MORTARS, 3=LIGHT, 4=HEAVY
C           XWPN(I,J+1)     NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
C                           MODE J=1,2
C           DXWYWP(I,M,J)   DISTANCE FROM X FORCE WEAPON TYPE I IN TACTICAL
C                           MODE J=1,2 TO Y FORCE WEAPON TYPE M OF WHICH
C                           M=11,20 ARE IN TACTICAL MODE 2
C           XTACA(A,B)      TACTICS ARRAY FOR ATTACKING FORCE X
C                           A=1 FOR LIGHT CATEGORY
C                           A=2 FOR HEAVY CATEGORY
C                           B=1 OPPOSING WEAPON CATEGORY
C                           B=2 DISTANCE BETWEEN A AND B=1
C                           B=3 PERCENTAGE OF NUMBER OF WEAPON TYPES
C                           IN TACTICAL MODE 1 THAT GO INTO TACTICAL MODE 2
C           DXFXWP(I,J)     DISTANCE FROM X FORCE CENTROID TO X FORCE
C                           WEAPON TYPE I IN TACTICAL MODE J=1,2
C
C
            DIMENSION  XCHR(10,5),YCHR(10,5),XWPN(10,3),DXWYWP(10,20,2)
          1,           XTACA(2,3),DXFXWP(10,2)
C
C
    1       DO 10 I=1,10
              DO 20 K=1,10
                DO 30 L=1,2
C
                  XCAT=XCHR(I,4)
                  IF(XCAT.EQ.3) THEN
                    IF(XTACA(1,1).EQ.YCHR(K,4)) THEN
                      IF(XTACA(1,2).GE.ABS(DXWYWP(I,K+(L-1)*10,1))) THEN
                        DIST = DXFXWP(I,1)
C
C                       DISMOUNT TROOPS
                          DO 40 M=1,10
                            IF(XCHR(M,4).EQ.1) THEN
                              IF(XWPN(M,2).GT.0) THEN
                                XWPN(M,3) = XWPN(M,2)
                                XWPN(M,2) = 0
                                DXFXWP(M,2) = DIST
                                DXFXWP(M,1) = -9999999
                              END IF
                            END IF
   40                     CONTINUE
```

```
      C
      C                          CHANGE TROOP CARRIER MODE
                                   DO 50 N=1,10
                                     IF(XCHR(N,4).EQ.3) THEN
                                       IF(XWPN(N,3).GE.0) THEN
                                         IF(XWPN(N,2).GT.0) THEN
                                            XWPN(N,3) = XWPN(N,2)
                                            XWPN(N,2) = 0
                                            DXFXWP(N,2) = DXFXWP(N,1)
                                            DXFXWP(N,1) = -9999999
                                         END IF
                                       END IF
                                     END IF
      50                           CONTINUE
                                   XOMV = 2
                                   RETURN
      C
                               END IF
                             END IF
                           END IF
      C
      30             CONTINUE
      20           CONTINUE
      10         CONTINUE
      C
      C
      C
                 RETURN
                 DEBUG  SUBCHK
                 AT 1
                 END
```

N 340 IBANK 77 DBANK

DIAMPUBLISH.TACOVW
91 04/01/82-10:33(0,)

```
C***************** SUBROUTINE TACOVW ***************************
C
C
C
      SUBROUTINE TACOVW(XOVWTH,XCHR,YCHR,XWPN,DXFXWP,DXWYWP,XTACA)
C
C     THIS SUBROUTINE ALTERS THE TACTICAL MODE OF ONLY HEAVY
C       CATEGORY WEAPON TYPES IN THE ATTACKING FORCE.  WHEN
C       A SPECIFIED OPPOSING WEAPON CATEGORY IS WITHIN A
C       SPECIFIED DISTANCE, THE HEAVY CATEGORY CAN GO INTO
C       OVERWATCH.
C
C
C     XOVWTH          INDEX FOR X FORCE:  1=NOT IN OVERWATCH,
C                     2=IN OVERWATCH
C     XCHR(I,4)       CATEGORY OF X FORCE WEAPON TYPE I:
C                     1=DISMOUNTED, 2=MORTARS, 3=LIGHT, 4=HEAVY
C     YCHR(K,4)       CATEGORY OF Y FORCE WEAPON TYPE K:
C                     1=DISMOUNTED, 2=MORTARS, 3=LIGHT, 4=HEAVY
C     XWPN(I,J+1)     NUMBER OF X FORCE WEAPON TYPE I IN TACTICAL
C                     MODE J=1,2
C     DXWYWP(I,M,J)   DISTANCE FROM X FORCE WEAPON TYPE I IN TACTICAL
C                     MODE J=1,2 TO Y FORCE WEAPON TYPE M OF WHICH
C                     M=11,20 ARE IN TACTICAL MODE 2
C     XTACA(A,B)      TACTICS ARRAY FOR ATTACKING FORCE X
C                     A=1 FOR LIGHT CATEGORY
C                     A=2 FOR HEAVY CATEGORY
C                     B=1 OPPOSING WEAPON CATEGORY
C                     B=2 DISTANCE BETWEEN A AND B=1
C                     B=3 PERCENTAGE OF NUMBER OF WEAPON TYPES
C                     IN TACTICAL MODE 1 THAT GO INTO TACTICAL MODE 2
C     DXFXWP(I,J)     DISTANCE FROM X FORCE CENTROID TO X FORCE
C                     WEAPON TYPE I IN TACTICAL MODE J=1,2
C
C
      DIMENSION   XCHR(10,5),YCHR(10,5),XWPN(10,3),DXWYWP(10,20,2)
     1,           XTACA(2,3),DXFXWP(10,2)
C
C
1      DO 10 I=1,10
         DO 20 K=1,10
           DO 30 L=1,2
C
             XCAT=XCHR(I,4)
             IF(XCAT.EQ.4) THEN
               IF(XTACA(2,1).EQ.YCHR(K,4)) THEN
                 IF(XTACA(2,2).GE.ABS(DXWYWP(I,K+(L-1)*10,1))) THEN
                   DIST = DXFXWP(I,1)
C
C                  SHIFT HEAVY WEAPONS INTO OVERWATCH
                     DO 40 M=1,10
                       IF(XCHR(M,4).EQ.4) THEN
                         IF(XWPN(M,2).GT.0) THEN
                           XWPN(M,3) = XWPN(M,2) * XTACA(2,3)
                           XWPN(M,2) = XWPN(M,2) - XWPN(M,3)
                           DXFXWP(M,2) = DIST
                         END IF
                       END IF
40                   CONTINUE
```

```
                         XCVWTH = 2
                         RETURN
      C
                      END IF
                    END IF
                  END IF
      C
      30        CONTINUE
      20      CONTINUE
      10    CONTINUE
      C
      C
            RETURN
            DEBUG  SUBCHK
            AT 1
            END
```

N 256 IBANK 73 DBANK

DIAM*PUBLISH.TALLY
RI   04/01/82-10:33(0,)

```
      C**********************  SUBROUTINE TALLY  **********************
      C
      C
      C
               SUBROUTINE TALLY(XWPN,EXTLSS,XARTLS,XMNLSS,XDEAD)
      C
      C        THIS SUBROUTINE CUMULATES XDEAD(I,J), TOTAL LOSSES OF
      C          X FORCE WEAPON TYPE I IN TACTUICAL MODE J=1,2.  THE
      C          REMAINING X FORCE WEAPON TYPES ARE ALSO DETERMINED.
      C
      C        XWPN(I,J+1)   NUMBER OF X FORCE TYPE WEAPON TYPE I IN
      C                      TACTICAL MODE J=1,2
      C        EXTLSS(I,J)   TOTAL EXPECTED LOSSES FOR X FORCE WEAPON
      C                      TYPE I IN TACTICAL MODE J=1,2
      C        XMNLSS(I,J)   MINE LOSSES FOR X FORCE WEAPON TYPE I IN
      C                      TACTICAL MODE J=1,2
      C
      C
               DIMENSION  XWPN(10,3),EXTLSS(10,2),XDEAD(10,2),XARTLS(10,2)
              1,           XMNLSS(10,2)
      C
      C
      1        DO 10 J=1,2
                 DO 20 I=1,10
      C
                   XWPN(I,J+1) = XWPN(I,J+1) - EXTLSS(I,J) - XMNLSS(I,J)
                   XDEAD(I,J)  = XDEAD(I,J) + EXTLSS(I,J) + XMNLSS(I,J)
      C
                   IF(XWPN(I,J+1).GT.0) THEN
                     IF(XARTLS(I,J).GT.XWPN(I,J+1)) THEN
                       XARTLS(I,J) = XWPN(I,J+1)
                     END IF
                   END IF
      C
                   XWPN(I,J+1) = XWPN(I,J+1) - XARTLS(I,J)
                   XDEAD(I,J)  = XDEAD(I,J) + XARTLS(I,J)
      C
      20         CONTINUE
      10       CONTINUE
      C
               RETURN
               DEBUG SUBCHK
               AT 1
               END
```

N 318 IBANK 51 DBANK

DIAMPUBLISH.TERIN
R1 04/01/82-10:33(0,)

```
C*********************** SUBROUTINE TERIN **********************
C
C
C
      SUBROUTINE TERIN(IBAT,KK25,PCRVBE,PCRVBW,PCRWVB,PCBVRE,PCBVRW,
     *                PCBWVR,DFCWC,AWDTH,BWDTH,RWDTH,DGMATT)
C
C     THIS SUBROUTINE LOADS THE FOLLOWING VISIBILITY TABLES,
C       CORRIDOR WIDTHS, WEAPON CATEOGORY DISTANCE OFFSETS,
C       AND DISENGAGEMENT CRITERIA
C
C     IBAT              POINTER TO GAMER SELECTED TERRAIN FILE
C     KK25              POINTER FROM VISIBILITY FILE
C     PCRVBE(I,J,K)     FRACTION OF RED FORCE WEAPON CATEGORY I
C                       (1=DISMOUNTED, 2=MORTARS, 3=LIGHT,
C                       4=HEAVY) VISIBLE TO BLUE FORCE WEAPON
C                       CATEGORY J (SEE ABOVE) IN THE KTH RANGE
C                       BAND (1=0-200, 2=200-400, 3=400-600,
C                       4=600-800, 5=800-1000) DURING ENGAGEMENT
C     PCBVRE(I,J,K)     FRACTION OF BLUE FORCE WEAPON CATEGORY I
C                       VISIBLE TO RED FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING ENGAGEMENT
C                       (SEE ABOVE)
C     PCRVBW(I,J,K)     FRACTION OF RED FORCE WEAPON CATEGORY I
C                       VISIBLE TO BLUE FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING BLUE FORCE
C                       WITHDRAWAL (SEE ABOVE)
C     PCBWVR(I,J,K)     FRACTION OF BLUE FORCE WEAPON CATEGORY I
C                       VISIBLE TO RED FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING BLUE FORCE
C                       WITHDRAWAL (SEE ABOVE)
C     PCRWVB(I,J,K)     FRACTION OF RED FORCE WEAPON CATEGORY I
C                       VISIBLE TO BLUE FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING RED FORCE
C                       WITHDRAWAL (SEE ABOVE)
C     PCBVRW(I,J,K)     FRACTION OF BLUE FORCE WEAPON CATEGORY I
C                       VISIBLE TO RED FORCE WEAPON CATEGORY J
C                       IN THE KTH RANGE BAND DURING RED FORCE
C                       WITHDRAWAL (SEE ABOVE)
C     DGMATT(A,B)       DISENGAGEMENT ATTRITION FRACTIONS OF
C                       WEAPON CATEGORY A (1=DISMOUNTED,
C                       2=MORTARS, 3=LIGHT, 4=HEAVY) AND
C                       FORCE B (1=BLUE, 2=RED)
C     DFCWC(A,B)        DISTANCE FROM B FORCE CENTROID TO WEAPON
C                       WEAPON CATEGORY CENTROID A (SEE ABOVE)
C                       ABOVE)
C     AWDTH(A,K)        CORRIDOR WIDTHS FOR ATTACKER WEAPON
C                       CATEGORY A IN RANGE BAND K (SEE ABOVE)
C     BWDTH(A,K)        CORRIDOR WIDTHS FOR WITHDRAWING BLUE
C                       WEAPON CATEGORY A IN RANGE BAND K
C                       (SEE ABOVE)
C     RWDTH(A,K)        CORRIDOR WIDTHS FOR WITHDRAWING RED
C                       WEAPON CATEGORY A IN RANGE BAND K
C                       (SEE ABOVE)
C
C
      DIMENSION  PCRVBE(4,4,5),PCRVBW(4,4,5),PCRWVB(4,4,5),
     *           PCBVRE(4,4,5),PCBVRW(4,4,5),PCBWVR(4,4,5),
     *           AWDTH(4,5),BWDTH(4,5),RWDTH(4,5),DGMATT(4,2),
```

```
      *               DFCWC(4,2)
C
C
C     SET K25 BASED ON DESIRED FILE
        DEFINE FILE 25(220,20,U,K25)
  1     K25=35*(IBAT-1)+1
C
C     READ RED VISIBLE TO BLUE DURING ENGAGEMENT
        DO 10 K=1,5
          READ(25'K25)((PCRVBE(I,J,K),I=1,4),J=1,4)
 10     CONTINUE
C
C     READ BLUE VISIBLE TO RED DURING ENGAGEMENT
        DO 20 K=1,5
          READ(25'K25)((PCBVRE(I,J,K),I=1,4),J=1,4)
 20     CONTINUE
C
C     READ RED VISIBLE TO BLUE WITHDRAWING
        DO 30 K=1,5
          READ(25'K25)((PCRVBW(I,J,K),I=1,4),J=1,4)
 30     CONTINUE
C
C     READ BLUE WITHDRAWING VISIBLE TO RED
        DO 40 K=1,5
          READ(25'K25)((PCBWVR(I,J,K),I=1,4),J=1,4)
 40     CONTINUE
C
C     READ RED WITHDRAWING VISIBLE TO BLUE
        DO 50 K=1,5
          READ(25'K25)((PCRWVB(I,J,K),I=1,4),J=1,4)
 50     CONTINUE
C
C     READ BLUE VISIBLE TO RED WITHDRAWING
        DO 60 K=1,5
          READ (25'K25)((PCBVRW(I,J,K),I=1,4),J=1,4)
 60    CONTINUE
C
C     READ OFFSET DISTANCES FOR BLUE THEN RED
        READ(25'K25)((DFCWC(I,J), I=1,4),J=1,2)
C
C     READ CORRIDOR WIDTHS FOR THE ATTACKER
        READ(25'K25)((AWDTH(I,J), J=1,5),I=1,4)
C
C     READ BLUE WITHDRAWAL WIDTHS
        READ(25'K25)((BWDTH(I, J), J=1, 5),I=1,4)
C
C     READ RED WITHDRAWAL WIDTHS
        READ(25'K25)((RWDTH(I,J),J=1,5),I=1,4)
C
C     READ DISENGAGEMENT CRITERIA
        READ (25'K25)((DGMATT(I,J),I=1,4),J=1,2)
C
      CLOSE(25)
      KK25=K25
      RETURN
C     DEBUG SUBCHK
C     AT 1
      END
```

N 153 IBANK 390 DBANK

DIAMPUBLISH.TIMENG
R1 04/01/82-10:33:0,1

```
C********************** SUBROUTINE TIMENG ********************
C
C
C
          SUBROUTINE TIMENG(XOVWTH,XYPKW,XYRGBD,XCHR,YCHR,YDFAT,
        1                    XDTCT,XTMENG)
C
C         THIS SUBROUTINE CALCULATES, XTMENG(I,M,J), TIME TO ENGAGE
C           FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2 TO ALL
C           Y FORCE TARGET TYPE M OF WHICH M=11,20 ARE IN TACTICAL
C           MODE 2
C
C         XOVWTH             INDEX FOR X FORCE:  NOT IN OVERWATCH=1,
C                            IN OVERWATCH=2
C         XDTCT(A,B,C)       X FORCE DETECT TIMES BASED ON EXPOSURE
C                            A, SENSORS B, AND RANGE BAND C
C         XYPKW(I,M,J)       PROBABILITY OF KILL FOR X FORCE
C                            WEAPON TYPE I IN TACTICAL MODE J=1,2
C                            AGAINST Y FORCE TARGET TYPE M OF WHICH
C                            M=11,20 ARE IN TACTICAL MODE 2
C         XYRGBD(I,M,J)      RANGE BANDS FOR X FORCE WEAPON TYPE I
C                            IN TACTICAL MODE J=1,2 AGAINST Y FORCE
C                            TARGET TYPE M OF WHICH M=11,20 ARE IN
C                            TACTICAL MODE 2
C         XCHR(I,1)          CONTAINS SENSOR TYPE FOR X FORCE
C                            WEAPON TYPE I:  EYE=1, OPTICAL=2
C                            THERMAL=3, IMAGE INTENSIFIER=4
C         YCHR(I,4)          CONTAINS CATEGORY OF Y FORCE WEAPON
C                            TYPE I:  DISMOUNTED=1, MORTARS=2
C                            LIGHT=3, HEAVY=4
C         YDFAT              Y FORCE DEFEND OR ATTACK VARIABLE:
C                            DEFEND=1, ATTACK=2
C         IEXPSR A:          VEHICLE EXPOSED=1, VEHICLE IN DEFILADE=2
C                            SOLDIER EXPOSED=3, SOLDIER IN DEFILADE=4
C
C
          DIMENSION XYPKW(10,20,2),XYRGBD(10,20,2),XCHR(10,5)
        1,          YCHR(10,5),XTMENG(10,20,2),XDTCT(4,4,5)
C
C
  100     DO 10 J=1,2
             DO 20 I=1,10
                DO 30 L=1,2
                   DO 40 K=1,10
C
                      ICAT=YCHR(K,4)
                      IF(XYPKW(I,K+(L-1)*10,J).GT.0) THEN
C
                         IF(ICAT.EQ.3) THEN
                           IF(YDFAT.EQ.2) THEN
                             IEXPSR=1
                           ELSE
                             IEXPSR=2
                           END IF
C
                         ELSE IF(ICAT.EQ.4) THEN
                           IF(YDFAT.EQ.2) THEN
                             IF(L.EQ.2) THEN
                               IF(XOVWTH.EQ.2) THEN
```

```
                                  IEXPSR=2
                                ELSE
                                  IEXPSR=1
                                END IF
                              ELSE
                                IEXPSR=1
                              END IF
                            ELSE
                              IEXPSR=2
                            END IF
C
                          ELSE IF(ICAT.EQ.1) THEN
                            IF(YDFAT.EQ.2)THEN
                              IF(L.EQ.2) THEN
                                IEXPSR=3
                              ELSE
                                IEXPSR=4
                              END IF
                            ELSE
                              IEXPSR=4
                            END IF
C
                          ELSE
                            IEXPSR=4
C
                          END IF
C
                          XTMENG(I,K+(L-1)*10,J) =
     1                      XDTCT(IEXPSR,XCHR(I,1),XYRGBD(I,K+(L-1)*10,J))
C
                        ELSE
                          XTMENG(I,K+(L-1)*10,J) = 9999999
                        END IF
C
                        IF(XTMENG(I,K+(L-1)*10,J).LE.0) THEN
                          XTMENG(I,K+(L-1)*10,J) = 9999999
                        END IF
C
   40                 CONTINUE
   30               CONTINUE
   20             CONTINUE
   10           CONTINUE
C
                RETURN
                DEBUG SUBCHK
                AT 100
                END
```

N 312 IBANK 75 DBANK

DIAMPUBLISH.THKLL
11 04/01/82-10:33(0,)

```
C********************** SUBROUTINE THKLL **********************
C
C
C
      SUBROUTINE THKLL(XTMENG,XCHR,XRDKLL,XYRGBD,XTHKLL)
C
C     THIS SUBROUTINE CALCULATES, XTHKLL(I,M,J), THE TIME TO KILL
C       FOR X FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2 AGAINST
C       Y FORCE TARGET TYPES M OF WHICH M=11,20 ARE IN TACTICAL
C       MODE 2
C
C     XYRGBD(I,M,J)  RANGE BANDS FROM X FORCE WEAPON TYPE I IN
C                    TACTICAL MODE J=1,2 TO Y FORCE TARGET TYPE
C                    M OF WHICH M=11,20 ARE IN TACTICAL MODE 2
C     XTMENG(I,M,J)  TIME TO ENGAGE FOR X FORCE WEAPON TYPE I IN
C                    TACTICAL MODE J=1,2 AGAINST Y FORCE TARGET
C                    TYPES M OF WHICH M=11,20 ARE TACTICAL MODE 2
C     XCHR(I,2)      CONTAINS FLIGHT TIME IN SECS/200 METER RANGE
C                    BANDS FOR X FORCE WEAPON TYPE I
C     XCHR(I,5)      CONTAINS TIME TO AIM, FIRE, AND RELOAD FOR
C                    X FORCE WEAPON TYPE I
C
C
      DIMENSION  XTMENG(10,20,2),XCHR(10,5),XRDKLL(10,20,2)
     1,          XYRGBD(10,20,2),XTHKLL(10,20,2)
C
C
1     DO 10 J=1,2
        DO 20 I=1,10
          DO 30 L=1,2
            DO 40 K=1,10
C
              IF(XYRGBD(I,K+(L-1)*10,J).EQ.0) THEN
                XTHKLL(I,K+(L-1)*10,J) = 0
              ELSE
                XTHKLL(I,K+(L-1)*10,J) = XTMENG(I,K+(L-1)*10,J)
     1            + (XCHR(I,5) + XCHR(I,2) * XYRGBD(I,K+(L-1)*10,J))
     2              * (XRDKLL(I,K+(L-1)*10,J))
              END IF
              XTHKLL(I,K+(L-1)*10,J) = XTHKLL(I,K+(L-1)*10,J) / 60.
C
40          CONTINUE
30        CONTINUE
20      CONTINUE
10    CONTINUE
C
      RETURN
      DEBUG SUBCHK
      AT 1
      END
```

260 IBANK 62 DBANK

```
DIAMPUBLISH.WPNDST
$1   04/01/82-13:33(0,)
C**********************  SUBROUTINE WPNDST  **********************
C
C
C
          SUBROUTINE WPNDST(DBFBWP,DRFRWP,DSTBR,BWPN,RWPN,DBWRWP,
         1                      DSTMIN)
C
C         THIS SUBROUTINE CALCULATES DBWRWP(I,M,J), THE DISTANCE
C           FROM BLUE FORCE WEAPON TYPE I IN TACTICAL MODE J=1,2 TO RED
C           FORCE WEAPON TYPE M OF WHICH M=11,20 ARE IN TACTICAL
C           MODE 2
C
C         DBFBWP(I,J)     DISTANCE FROM BLUE FORCE CENTROID TO BLUE FORCE
C                         WEAPON TYPE I IN TACTICAL MODE J=1,2
C         DRFRWP(K,L)     DISTANCE FROM RED FORCE CENTROID TO RED FORCE
C                         WEAPON TYPE K IN TACTICAL MODE L=1,2
C         DSTBR           DISTANCE BETWEEN BLUE AND RED FORCE CENTROIDS
C         BWPN(I,J+1)     NUMBER OF BLUE WEAPON TYPE I IN TACTICAL
C                         MODE J=1,2
C         RWPN(K,L+1)     NUMBER OF RED WEAPON TYPE K IN TACTICAL
C                         MODE L=1,2
C         DSTMIN          MINIMUM DISTANCE BETWEEN OPPOSING WEAPONS
C
C
          DIMENSION  DBFBWP(10,2),DRFRWP(10,2),BWPN(10,3)
         1,          RWPN(10,3),DBWRWP(10,20,2)
C
I         DO 10 J=1,2
            DO 20 I=1,10
              DO 30 L=1,2
                DO 40 K=1,10
C
                  IF(BWPN(I,J+1).GT.0 .AND. RWPN(K,L+1).GT.0) THEN
                    DBWRWP(I,K+(L-1)*10,J) = DSTBR-DBFBWP(I,J)-DRFRWP(K,L)
                  ELSE
                    DBWRWP(I,K+(L-1)*10,J) = -9999999
                  END IF
C
40              CONTINUE
30            CONTINUE
20          CONTINUE
10        CONTINUE
C
C         DETERMINE MINIMUM DISTANCE BETWEEN OPPOSING WEAPONS
            DSTMIN = ABS(DBWRWP(1,1,1))
            DO 50 I=1,10
              DO 60 M=1,20
                DO 70 J=1,2
                  DSTMIN = AMIN1(DSTMIN,ABS(DBWRWP(I,M,J)))
70              CONTINUE
60            CONTINUE
50          CONTINUE
C
          RETURN
          DEBUG  SUBCHK
          AT 1
          END
```

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